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War News by Radio

It is through a curious chain of circumstances that public attention has recently been brought to the reliability of transatlantic wireless telegraphy. Following the interruption of direct communication by cable between the United States and Germany, and as a consequence of severe censorship by the allied powers through whose telegraphic systems messages from Germany were forced to pass in attempting to reach America, no information of unquestioned German origin could be had except via the radio stations at Sayville, L. I., and Tuckerton, N. J. Through a complication in the matter of federal license the Tuckerton plant was closed temporarily at first, and it is now disabled, leaving Sayville as the only station by way of which reports from Berlin are received. The conflicts in statement between dispatches coming from London and Paris through the usual channels and those said to be "wirelessed" from Germany soon caused doubt as to the accuracy, and even the possibility, of radio transmission direct from Nauen to the United States. In an article on page 615 of this issue Mr. John L. Hogan, Jr., describes the Sayville plant and discusses its capabilities as they pertain to transatlantic wireless telegraphy. The implication that receipt of Berlin's messages is impossible, which is heard frequently in the cries of "faked news," would seem to have no foundation in so far as the engineering progress of radiotelegraphy is concerned. Although continuous twenty-four-hour commercial service has never been established between Europe and the United States, it has repeatedly been shown that messages might be transmitted over the great distance with moderate ease whenever daylight absorption and static interference were small. As Mr. Hogan points out, although there is no information available to prove or disprove the veracity of the press messages supposed to have been forwarded through Sayville, the technical condition of radio transmission is such that Nauen might easily send to Sayville for several hours each night.

Hasten the Railroad Case

The Interstate Commerce Commission will give the railroads a chance to prove that war conditions make an advance in rates now imperative. Painfully solicitous for shippers who might want to testify, the commission has put off the commencement of hearings for a month. This is precious time lost. It is unfortunate that the commission could not have seen its duty clear to act immediately. In the original case the proceedings and subsequent consideration of testimony dragged on for weary months until the patience and hope of the carriers were tired to exhaustion. If the commission will leave out useless formalities, if it will "cut the red tape" which is the notorious accompaniment of government procedure, it can give relief when relief will do most good. At the risk of being regarded as unthinking and uninformed we are so heedless as to believe that no re-hearing is necessary in a case that is as plain as day, but that heretical criticism fails to take into account the apparent idea of the commission that the form is almost as important as the substance. The hearing process, long and debilitating as it may prove to be, is not a necessary preliminary to railroad relief, yet valuable time is to be spent on it. There can be no assurance at this early day as to the length of time that will be required for presentation of new testimony to convince the commission that railroad conditions have undergone revolutionary change; but by every moment that it is shortened credit will be strengthened and resources conserved. The material interests of the country are so deeply concerned in the question of railroad prosperity that it behooves the commission to expedite action. Public utilities are concerned because their welfare is bound up with general industrial welfare and because a recognition of the harmful influences in the railroad situation will lead inevitably to a recognition of the effect of the same influences on all utilities. Prompt relief for railroads is one of the desirable early steps to repair the disaster done to business here by the awful European war.

Dividends in Scrip

The declaration of a dividend in scrip announced by one of the public utility holding companies calls attention to a method of financing that may appear to be desirable for other properties. The Philadelphia Company will pay its current dividend on the common stock in scrip redeemable on or before May 1, 1916, and bearing 7 per cent interest. The effect of this, of course, is that the company borrows the amount of the dividend from shareholders at 7 per cent for eighteen months with the privilege of prepayment. It is easier for the company to borrow from shareholders than through banks or bond dealers; it is likewise cheaper. Under present conditions banks are not encouraging new loans, and for companies that are short of cash the alternatives are presented of payment in scrip or of the passing or reduction of the dividend. To the present time most of the companies that have found it prudent or necessary to conserve cash resources have done so by either passing or reducing the dividend, but with the gradual improvement of the banking situation which is likely to come about, the other alternative of payment in

scrip should be adopted by more of such companies whose earnings still remain good. With every day that goes by the end of the financial distress and commercial stagnation in Europe is nearer, and, however desirable it may appear to be now to hold cash in hand, sooner or later new financing will have to be done. When securities are to be sold it will help the public utility companies to get satisfactory prices if they can point to an uninterrupted dividend record. Payment in scrip is a smaller adverse credit factor than the complete omission of a dividend. In the many properties of financial integrity whose revenues are substantially unaffected by the results of war there are certainly sound reasons why the credit position should be kept strong so as to protect the cost of future financing.

The Color of Illuminants

Any color is capable of being expressed in terms of red, green and blue components, as was explained by Maxwell, Helmholtz and other physicists. This is sometimes called the trichromatic analysis of color. There is, however, another method, which determines the dominant hue and the amount of white which must be associated therewith in order to make a match. This is sometimes called the monochromatic analysis. The use of the monochromatic analysis and a particular form of monochromatic analyses are described in a paper by Mr. L. A. Jones, read at the Cleveland convention of the Illuminating Engineering Society. The instrument is very interesting, but is somewhat complex optically, containing, as it does, three pairs of Nicol's prisms, two pairs of collimating lenses, a Lummer-Brodhun cube, a constant-deviation prism and several transparent reflectors. However, the results obtained in its measurements of the colors of test lamps appear to be definite and direct. As a source of white light, the noonday sun is used. It will be interesting to have a series of comparison color measurements made with this and with a trichrometric analyzer.

The Supreme Court a National Bulwark

In this age of extremists and radical reformers the recent Phi Beta Kappa address at Harvard University of former President Taft upon the functions of the United States Supreme Court should strike a responsive chord in the breast of every lover of constitutional liberty. Certainly the opinions of the former President upon the nation's chief tribunal are those of a duly qualified expert, and the speaker's thesis that the court constitutes a national bulwark against ill-considered popular whims may well be emphasized for the sake of innumerable public utility officers and security holders who may at times be disquieted about the waves of radicalism which sweep here and there throughout the country. In a masterly review of the work of the court in relation to matters in which there seemed to be a conflict between its decisions and the contemporaneous view of the people, Mr. Taft demonstrated that the will of the people has never been defeated by the court, but its acts have been generally acquiesced in by the people and its decisions vindicated by subsequent events. Here is a tribunal unique in the history of government, with greater power, much of it necessarily political in the broad sense, than any other court that ever sat. Its standing before the world shows how patriotically and ably, and with what wise moderation, it has exercised its tremendous power to help the people in their task of self-government. "It lives to-day," said Mr. Taft, "strong, virile, courageous, able, willing to recognize progress, to treat the constitution in the way it has always treated it, elastic enough to permit a construction which will conform to the growth and necessities of the country, and yet determined to enforce the principles of individual right and the essential limitations upon the branches of the government which are provided for in our fundamental law." In a time when the suddenness of progressive measures seems more important than their wisdom, the country needs the conservative hand of the court, not to prevent reform by the exercise of the popular will but to prevent change by popular whim. The history of the court in previous political crises and its quiet but effective strength to outlive attacks should engender courage, and whenever every other branch of government fails in sane, sound action the Supreme Court can be relied on as a bulwark to save the country from the injurious effects of hasty action on the part of a majority of the electorate.

A Peculiarity of Gas-Filled Lamps

A note in the Digest this week gives some definite information about a peculiarity of gas-filled metallic-filament lamps which is especially striking. Since all such lamps have a positive temperature coefficient, the initial rush of current is much larger than the current of steady flow. The present investigation takes up the matter from an exact quantitative standpoint, and the information disclosed is of a most interesting character. The theoretical initial current is, of course, determined by the impedance of the lamp. Ohmic resistance cold would indicate that the possible current in the gas-filled lamp is about twelve times the steady current, which, of course, is relatively reduced as compared with the vacuum lamp on account of the higher temperature at which the filament is worked. An examination with the oscillograph showed about 70 per cent of this ratio, and for the 500-watt and 1500-watt sizes there was a period of about one-third of a second before steady flow was finally established. The current approximates twice its steady value in about one-twentieth of a second. The possible current taken by gas-filled lamps is, therefore, so great as to need consideration in the setting of circuit-breakers and in the instantaneous effects on the voltage. In fact, the gas-filled lamp takes relatively a considerably greater starting current than the alternating-current motors, which usually have enjoyed a bad reputation in this respect. Fortunately, the high current in the case of the lamps is very brief, so brief as hardly to cause more than a momentary drop in the

voltage, but in setting circuit-breakers it is found necessary to adjust them for about six times the steady load current for a momentary maximum, which indicates the need of interposing a slight time-lag in order to insure safety. It is not improbable that this peculiarity of the gas-filled lamps may actually be turned to advantage in some problems of regulation, since the filament acts like a wide-open valve automatically closing to a definite point in a small fraction of a second.

Some Idiosyncrasies of Rainfall

A recent hydraulic study by a Norwegian engineer in which the flow of a utilized stream was thoroughly investigated with reference to its bearing upon hydro-electric energy supply incidentally brings to the front some curious facts. A thorough study of the Norwegian rainfall based on observations taken at about 500 stations and covering a period from 1875 to 1909 was recently made by Professor Mohn. As in the case of some earlier investigators, he discovered a very remarkable correspondence between rainfall and the sun-spot period of about eleven years. The large minima of the rainfall graph corresponded with great precision with the sun-spot minima, and the maxima also on the whole corresponded remarkably well. Some relation between terrestrial meteorology and solar meteorology, so to speak, may fairly enough be considered reasonable, and the agreement between the data in this Norwegian case is surprisingly complete upon the face of the returns.

In the hydraulic study which serves as a text of these remarks it is a striking fact that the very worst deficit of flow occurred at a sun-spot maximum. The preceding sun-spot minimum was a year of at least average flow, while the succeeding minimum was low, yet better by at least 10 per cent than the flow of the maximum sun-spot year, which was the lowest for the thirty-five years of observation. It is painfully evident from this, as from many other similar data, that theories apparently well confirmed by the average of many observations are yet very unsatisfactory as a practical guide. Man has as yet discovered no reliable clew to long-distance rainfall predictions. There may exist a long cycle of weather, as various meteorologists have supposed, but the cycle is certainly of a very loose and general character, significant only with respect to large averages over very great regions and altogether masked by local conditions of an apparently fortuitous character. It would be of great service to the resources of the country if the government departments could begin a more thorough study of rainfall and run-off than they have yet been able to make. Persistent gagings in many localities coupled with a study of the geological formations and local topography may give within a not unreasonably long term of years sufficient data as to flow to save many an unwise expenditure and to point out in advance many difficulties. The governmental work already done is excellent in quality but deficient in quantity.

Efficient Prime Movers

Several articles in our foreign contemporaries have raised again the question of the relative economy of gas and steam engines. The subject itself is much worn, but something of interest is lent to its present consideration by bringing to the front the matter of valuable by-products partly offsetting the cost of energy. Without doubt the gas engine under favorable circumstances is a reasonably cheap source of energy, particularly in the smaller units. In these, however, the matter of by-products cannot seriously enter, since only in working on a large scale are by-products a practicable source of revenue, and the success of the by-product profit depends on the price which can be obtained, which in turn hinges on the supply. The large internal-combustion engine has made an excellent record where blast-furnace gases are available. With natural gas or producer gas it does well in units of large size, but with gas of illuminating quality the economic outlook is not good, except in very small sizes. Producer systems of considerable size have been used abroad with fair success, and a number are giving good results in this country, without, however, having obtained a sufficient reputation largely to increase their use. At present they seem to be of special rather than general applicability, but in some localities and with good care have shown excellent economy.

In the report of the National Electric Light Association committee on prime movers, upon which we recently made comment, it was made quite clear that in very large units the steam turbine can outrun even producer-gas-engine equipments in thermal efficiency, particularly at loads somewhat below the normal. In fact, at full load a 20,000-kw turbine can operate at a thermal efficiency of 24 per cent in the turbo-generator itself, and with boilers as efficient as the large units tested in Detroit a year or two ago the efficiency will come very close indeed to 20 per cent from the coal to the electrical energy. Only the oil engine seems able to improve on this efficiency to any material extent, and the oil engine is limited to rather moderate sizes so far as the present outlook goes. In smaller units, say of 1000 kw or 2000 kw, the tables are turned, and it is in such cases that the internal-combustion engines can more than hold their own.

It must not be forgotten, however, that the large steam turbine is not without a rival in steam efficiency. Unless we are very much deceived in the figures which have been repeatedly published, the efficiency of a first-class high-efficiency reciprocating-engine equipment of the locomobile type is equal to that of the large steam turbine. The locomobile is certainly capable of producing a brake-hp-hour with 10 lb. of steam, which means less than 14 lb. per kw-hr., a figure not easily reached in turbines of any moderate size up to the present time. While, therefore, the internal-combustion engines in units of moderate size cannot be left out of account in central-station economics, it is a question where they will stand when the smaller steam units establish the efficiency that is within their reach.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

Prospects for Adamson Bill Lessened

Although administration leaders in Congress have not dropped the Adamson water-power bill, the European war has lessened the enthusiasm which attended the introduction, report and passage of the bill in the House. Congress now believes that there is no reason for the quick passage of the water bill, "because there is no money to be invested in dams," to use the words of a member of the interstate and foreign commerce committee of the House. However, if the Senate will report and pass a bill omitting the conservation ideas which are so repugnant to Representative Adamson, it is probable that a conference between the Senate and House will weld a measure which will be far removed from the House bill as it passed that body. Representative Adamson's one ambition respecting the bill is to rid it of all of what he terms "Pinchot foolishness." He has frequently expressed the opinion that "he would like to see a bill passed that would result in capital being invested in a few dams—not a bill passed to obstruct the building of useful dams."

Economics of the Half-Watt Lamp

In a paper on "New Developments in Incandescent Lamps," read at the recent convention of the Vermont Electrical Association at Brattleboro, Mr. C. W. Betcher, Harrison, N. J., pointed out that the gas-filled lamp now has 55 per cent of daylight color in its luminous flux, compared with 40 per cent in the case of the 1-watt-per-cp tungsten lamp and 22 per cent in the 3.1-watts-per-cp carbon-filament incandescent. Lamps of this type now range from 200 watts to 1000 watts in rating at pressure ranges of from 105 volts to 125 volts. The 1000-watt lamp, burning only three or four hours a night, yields a revenue of $100 a year at 10 cents per kw-hr. and is specially adapted to the lighting of store and theater fronts, yards, etc. All these units are valuable in competing with gas arcs. The cost of connecting a 1000-watt unit to central-station circuits should not exceed from $1 to $2, so that the sales expense runs much lower than with many other classes of load. American manufacturers have now standardized the length of gas-filled lamps from the cap of the base to the center of the light source, which greatly facilitates the design and application of suitable reflectors.

House Passes Patent Office Bill

The House of Representatives on Sept. 21 passed the committee bill to reorganize the Patent Office, increasing the number of examiners in chief from three to five and the number of law examiners from two to five, at an expense of something like $60,000 a year.

During the debate Mr. Oldfield, in explanation of the bill, said, in part: "The inventors of the country are not getting thorough searches. The business of the Patent Office has grown so rapidly in the last ten years that they are not getting proper searches because the force is not sufficient. The Patent Office will have a surplus this year of more than $200,000. It has a surplus now, since the office was established, of $7,000,000."

The bill went to the committee on patents from the Commissioner of Patents, and Commissioner Ewing said in regard to it:

"I cannot too strongly urge the need of this reorganization and increase of the force. The business of the office to-day is larger than it has ever been. The number of applications filed and the labor of examining each application increase steadily with the growth of the literature of the various arts, so that the office force is less adequate to do the work which it has to do than it was ten years ago.

"It is the function of the office to prevent the granting of patents which should not be granted, and the insufficiency of provision for its work results inevitably in improperly granting patents, with consequent burden upon the public."

Recent Activities of the Society for Electrical Development, Inc.

The September report to members of the Society for Electrical Development, Inc., shows the progress made by the various sections during the past month. In both St. Louis and Duluth a committee was formed to cooperate with the municipal authorities in framing the city ordinances. Investigations have been made in large cities of the Central States on the uses of electricity in various directions, and manufacturers have been visited with a view to securing closer co-operation on their part with the engineering department. A list of all the manufacturer members' catalogs has been completed, and the society is now collecting city ordinances relating to electric wiring, signs, etc. The pamphlet devoted to electrical devices for home comforts will be ready in the course of this month for distribution by members to prospective customers. It is proposed to send a window transfer embodying the membership emblem of the society in gold and colors and mounted on celluloid for framing to each member.

The first design for a series of six picture stamps has been approved and is now in the hands of the lithographer. No decision has yet been reached in the prize-story competition, and since everything bearing a postmark not later than Sept. 1 is eligible some little time will elapse before the result can be announced. A series of six designs has been adopted for street-car advertisements. The window-display department, in conjunction with the news and editorial departments, is planning a campaign to secure the various mercantile trade papers as members of the society. The section has also completed plans for an ornamental street-lighting campaign. The play entitled "This Is the Life," in two reels, is now being shown in forty-five different cities. Other films of a similar character will be released this month and next. The society is also compiling a list of motion-picture films owned by its members, with a view to having them for use at entertainments or lectures, this having proved a popular method of promoting the use of electricity.

Annual Meeting of Roentgen Ray Society

The fifteenth annual meeting of the American Roentgen Ray Society was held in Cleveland, Ohio, Sept. 9-12. The program, which extended over four full days, contained a large number of papers of extreme interest. It was arranged in the form of symposiums treating of the use of Roentgen rays in examinations of the head and chest, intestinal diagnosis, gastric and duodenal diagnosis and Roentgen dermatitis.

A meeting of special electrical interest was the symposium on hard rays. Messrs. J. S. Shearer, W. D. Coolidge, W. Duane, H. Clyde Snook and H. W. Van Allen participated. The relation between penetrating quality and voltage or current was discussed at considerable length, and the opinion was prevalent that X-ray tubes should be standardized by a special laboratory before placing them upon the market.

The inefficiency of the production of Roentgen rays was brought out by Dr. Coolidge, who stated that the losses are negligible in transformation of the energy into cathode rays, but only a small fraction of 1 per cent of the cathode-ray energy was converted into X-rays. As a matter of fact, about 99.8 per cent of the cathode-ray energy was lost in heat. A further loss is represented in the inefficiency of utilization of the X-rays produced.

The meetings were well attended, there being an average assemblage of about 200.

A large exhibit of Roentgen ray photographs, many of which were double radiograms for stereoscopic viewing, was made. The exhibit of new X-ray apparatus and supplies was also quite elaborate. The new X-ray tube developed by Dr. Coolidge was a source of much interest and favorable comment.

Roentgenology has become an extensive applied science and stands as a great monument to the discoverer of X-rays and to science in general.

Convention of Massachusetts Electrical Contractors

A large and enthusiastic convention of the Electrical Contractors' Association of Massachusetts was held at the Hotel Bancroft, Worcester, on Sept. 23 and 24, among those in attendance being President John R. Galloway of the National Electrical Contractors' Association, Washington, D. C.; Past-president Marshall L. Barnes, Troy, N. Y.; National Director George E. Shepherd, Wilkes-Barre, Pa., and Secretary Arthur R. Jones of the Electrical Contractors' Association, Cleveland, Ohio.

The program included the following paperes and addresses: "The Contractor's Troubles and the Remedy," by Mr. W. K. Tuohey, Springfield, Mass.; "The Electrical Contractor and Lighting Service," by Mr. M. D. Cooper, National Electric Lamp Works, Cleveland, Ohio; "Leadership," by Mr. George E. Shepherd; "The Society for Electrical Development," by Mr. George B. Muldaur, New York; "Policing in Organization," by Mr. A. R. Jones; "Relation of Electrical Code to Contractor," by Mr. Ralph Sweetland, Boston, Mass.; "Central Station and Contractor," by Mr. H. D. Learnard, Worcester; "Auditing and Accounting," by Mr. A. R. Jones, and "Legislation as It Affects the Contractor," by Mr. A. J. Hixon, Boston, Mass. Abstracts of these papers will be printed in a later issue. The program also included a sight-seeing trip to the insulating department of the American Steel & Wire Company at Quinsigamond, and a banquet at the hotel on Thursday night. A vigorous rejuvenation of the Jovian Order took place on Wednesday evening with a good attendance.

Trust Legislation Reported to Senate

Senator Culberson, chairman of the conference committee of the House and Senate on the Clayton anti-trust bill, reported that measure to the Senate, in the form of the conference agreement, late on the afternoon of Sept. 23. He gave notice that he would call up the report at the earliest possible moment.

The measure as agreed to, and as it will go to the President for signature, contains the clause prohibiting price discriminations which was placed in the bill by the House and later stricken out by the Senate. The prohibition strikes at discriminations, direct or indirect, which substantially lessen competition or tend to create monopoly.

The measure also retains the prohibition against tying contracts or exclusive contracts in articles, whether patented or unpatented, although the penalty provision attached to this clause in the Senate has been stricken out and the prohibition applies only in cases where competition is substantially lessened or monopoly created.

The Senate language has been retained in clauses which would exempt labor unions and farmers' organizations from the operation of the anti-trust laws.

Indianapolis Street-Lighting Contract

In the report of the directors of the American Public Utilities Company interesting reference is made to the street-lighting contract obtained by the Merchants' Heat & Light Company, of Indianapolis, one of the subsidiaries of the American Public Utilities Company. It is said that the contract calls for the installation of more than 2500 arc lamps, a considerable amount of ornamental street lighting and approximately 1000 incandescent lamps for alleys. The gross revenue from this source will amount to about $125,000 a year. The construction of the lines necessary to carry out the contract is now in progress. Under the terms of the contract a saving to the city of approximately $75,000 a year will be effected, and the company is enabled to extend its service at small cost.

Important Patents on Mercury-Vapor Apparatus

The Patent Office issued last week to the Cooper Hewitt Electric Company sixty-two patents relating to systems of lighting and of rectification by means of vapor-electric apparatus. Among the individual inventors, all of whom have assigned their inventions to the Cooper Hewitt Electric Company, are Dr. Peter Cooper Hewitt and Messrs. Percy H. Thomas, Max von Recklinghausen, Frederick H. von Keller, Charles Orme Bastian, Joseph C. Pole and Stanwood E. Flitner. Some of the patents, owing to complicated interference proceedings, have been pending in the United States Patent Office for ten years or more, one of them (Hewitt's patent No. 1,110,562) going back to an original application filed April 11, 1898. This patent of Dr. Hewitt is particularly broad in scope since it covers necessary methods of operating vapor lamps throughout the region commonly considered characteristic of quartz mercury-vapor lamps.

Other patents of importance relating to the quartz-lamp art are those issued to Charles Orme Bastian and bearing the numbers 1,110,607, 1,110,608, 1,110,-609 and 1,110,985. These Bastian patents appear to supplement his former patent No. 1,079,926, as a sort of rounding up of the Bastian system of vapor apparatus.

Patents issued to Thomas relate to a variety of de-

vices important in the development of the Cooper Hewitt vapor-rectifier arts wherein the Cooper Hewitt apparatus is adapted for use in arc-lighting systems; in railway work; in the charging of storage batteries, and systems wherein the lamp itself is operated in series and in parallel. The patents to Von Recklinghausen relate to improvements in Dr. Hewitt's rectifier utilizing a container of metal.

The patents to Von Keller relate to starting apparatus for vapor lamps and to a high-tension vapor converter.

Flitner's patent relates to tilting supports used in starting vapor devices.

Altogether, the patents are of wide scope and importance in the arts of vapor utilization for lighting or rectification purposes.

CONVENTION OF EDISON ASSOCIATION

Generating and Distribution Problems Discussed—Latest Developments in the Mercury Turbine, in Fuel Economy and in the Elimination of Smoke

An account of the first two days' session of the convention of the Association of Edison Illuminating Companies, held at White Sulphur Springs, W. Va., Sept. 14 to 17, was given in these columns last week. Three sessions were held on the last day of the meeting, the third being a banquet at which the following officers were elected for the year:

President, Mr. Walter F. Wells, Brooklyn, N. Y.; vice-president, Mr. Peter Junkersfeld, Chicago, Ill.; treasurer, Mr. Louis A. Ferguson, Chicago, Ill.; secretary, Mr. George C. Holberton, San Francisco, Cal.; executive committee, Mr. Charles L. Edgar, Boston, Mass.; Mr. W. W. Freeman, Cincinnati, Ohio; Mr. Samuel Insull, Chicago, Ill.; Mr. John W. Lieb, Jr., New York, and Mr. Joseph B. McCall, Philadelphia, Pa.

Handsome engrossed testimonials of regard were also presented by the association to Mr. C. A. Coffin, retiring president, and to Mr. E. W. Rice, Jr., the new president of the General Electric Company.

Features of Technical Program

Mr. W. L. R. Emmett opened Thursday morning's technical program with an address on "Mercury Turbine Developments and Possibilities," in which he discussed the proposal to increase greatly the thermal range and efficiency of present steam plants by first using the heat of the boilers to operate turbines running on mercury vapor at pressure near atmospheric, the exhaust from these turbines being then employed to generate steam in condenser boilers, this steam to operate steam turbines as usual.

The report of the committee on steam operation, Mr. J. D. Andrews chairman, was chiefly given over to statements by the manufacturers of power equipment. Suggestions were also offered, however, for the determination of the ash-fusing point in the purchase of coal on a heat-unit basis, since the commercial value of a coal depends upon the tendency of its ash to clinker. Figures given for the operating economy of the 25,000-kw and 20,000-kw turbine units of the Commonwealth Edison Company showed an average water rate of 12.13 lb. per kw-hr. and a coal consumption of 1.92 lb. coal per kw-hr.

Generating and Distribution Problems

In his paper on "Single-phase Loads from Polyphase Systems," Mr. B. G. Lamme described the transformation of single-phase loads into polyphase loads by means of polyphase motor-generator sets and by means of polyphase rotary converters. Regulation is accomplished by double-field boosters, induction regulators, etc.

Mr. Paul M. Lincoln discussed "Protection Against Effects of Grounds and Short-Circuits," and recommended the position grounding of neutrals, using resistance leads to prevent a single other ground from causing a short-circuit. The ground-lead resistance should be of such value as to limit the current flow at normal voltage to about twice that necessary to operate the heaviest circuit-breaker on the system.

Much of the report of the committee on high potentials was given over to the subject of insulators, and the superiority of high-frequency tests was emphasized. A compact oscillatory testing set was described. This set is designed to be moved along the line, the insulators being tested in place, thus increasing the reliability of the line. Disconnect switches in the grounding wires of transformer cases were recommended for the safety of the lineman. The protection of high-voltage generator coils from corona by the use of metallic binding tape was declared to have been successful.

Generating Plant Topics

The committee on load-factor, Mr. J. W. Lieb, Jr., chairman, recommended adoption by the association of the A. I. E. E. definition of load-factor, the year being taken as the period unless otherwise specified. Maximum load or demand was defined as the highest half-hour average load or demand except where otherwise specified.

In their paper entitled "Accounting for the Variation in the Coal Economy of a Large Central Station." Messrs. C. H. Parker and R. E. Dillon discussed the effects on operating results of the factors of back pressure, loading, steam pressure, superheat, boiler-feed temperature, fuel, value of coal, load-factor, etc., and presented curves by which the coal economy of a station may be corrected for variations of these variables. Results with a fair-sized steam plant were given for comparison.

"The Central Station in Its Relation to the Problem of City Dust" was treated by Messrs. R. B. Bolton, C. B. Grady and Dr. J. A. Deghuee, and the cinder catchers installed at the New York Edison Company's Waterside stations were described in detail. Comparative tests have shown that whereas an unequipped stack discharged cinders amounting to from 1 to 2 per cent of the weight of coal fired, in the case of another similar stack equipped with a cinder catcher about 95 per cent of the cinders and ash was removed. Air-cleaning and cooling apparatus for treating the air used to ventilate generators and transformers was also described. Aside from other advantages the cooling of the ventilating air results in valuable increased station capacity, it was pointed out.

Electric Vehicles and Battery Service

Much information on the use of electric vehicles in Germany was contributed by Mr. E. W. Lloyd to the report of the committee on electric vehicles, Mr. George H. Jones chairman. The 600 electric taxicabs of Berlin, the imperial parcel-post delivery wagons, city street-sprinkling carts, etc., therein mentioned, were described in an interview with Mr. Lloyd published in the *Electrical World* of Aug. 15. Battery-operated railroad cars representing an investment of $3,000,000 are now used on 4000 miles of German railroads. As one solution of the garaging problem, the committee outlined a plan by which vehicles would be sold without batteries, battery service being furnished by a maintenance company at a fixed price per month (depending upon the size of the vehicle) plus a mileage charge.

CONVENTION OF MUNICIPAL ELECTRICIANS

Discussion on Police and Fire Alarm Signal Systems and Grounding of Signal Boxes—Association Adopts Rules on Overhead Line Construction

The nineteenth annual convention of the International Association of Municipal Electricians began at the Hotel Islesworth, Atlantic City, N. J., on Sept. 15 with President J. W. Kelley, of Camden, N. J., presiding and 150 members and guests in attendance. The membership of the organization comprises representatives from the municipal electrical departments of American cities with a total population of more than 40,000,000. Mayor William Riddle of Atlantic City welcomed the delegates, and Treasurer C. E. Diehl of the association responded. Dr. C. P. Steinmetz, vice-president of the association, was also called upon, and he summarized the purposes and activities of the association members, noting their administration of fire-alarm systems to minimize fire waste, of police-alarm systems to promote public safety, and of electrical inspection to prevent increasing public hazards from the utilization and distribution of electrical energy.

Insulation Tests

A paper on "Insulation Tests," presented by Mr. P. I. Patton, mentioned frequent injuries due to receiver cords, which in practice are far too ineffectively insulated. A series of tests on different types of cords now in service was detailed, all of these cords failing to maintain satisfactory insulation upon short exposure to moisture. The Philadelphia plan of covering cords with high-grade 1/16-in. wall-rubber tubing was recommended as a means for avoiding danger to the user.

Illumination

Mr. C. S. Redding, in a paper on "Measurement of Illumination," briefly reviewed the progress of illumination methods up to the present day and gave in detail the considerations involved in selecting the lamps and amount of illumination necessary for public lighting requirements. The "illuminometer" developed by the Macbeth company was also described at some length.

Following the presentation of the paper, Dr. C. P. Steinmetz gave a summary of the work of the joint investigation made in New York City streets on the safest and most attractive types of lamps and intensities of illumination.

Mr. Yeakel, of Baltimore, suggested the need of more accurate standards and disinterested advice in protecting the public's interest when adopting municipal lighting plans and signing contracts, and after some further discussion a standing committee on illumination was appointed to assist members in such cases.

Maintenance of Police and Fire Alarm Telegraph Systems

The paper of Mr. R. J. Gaskill, superintendent of fire alarm, Fort Wayne, Ind., on "Education of the Public in Using the Fire-Alarm System," discussed the frequent delay or omission in sending fire alarms caused by the public's lack of knowledge of the location of alarm signal boxes, or even of the method of operating them. The effectiveness of conspicuous colors for the box and supporting pole, the use of distinctive illumination at boxes during darkness, the demonstration of box operation at the frequent public gatherings and the use of public press notices were recommended.

"Safe Grounding for Fire and Police Signal Boxes" was discussed by Mr. A. C. Farrand, city electrician of Ventnor City, N. J., who made some suggestions for the disposition also of insulating material. It was stated that any person touching the usual fire alarm or signal box with ungrounded metal case may be subjected to shock. Mr. Farrand suggested the use of insulating material for both inner and outer shells of these boxes and the grounding only of the movable operating parts.

Grounding Signal Boxes

The report of the committee on grounding was presented by Mr. T. O'Hearn, city electrician of Cambridge, Mass. The association a year ago went on record as indorsing the grounding of all exposed metal parts of alarm and signal boxes in cities, and this committee was directed to investigate methods of grounding with the co-operation of the National Bureau of Standards.

Partly as a result of these tests, and upon other advice obtainable, the committee presented its conclusions and recommendations as follows:

(1) That ground connection be made to metal water mains where these exist, and that ground wires be run not less than 500 ft., if necessary to secure such a connection.

(2) That ground connections, if necessarily made to artificial grounds, be interconnected so that not less than four such separate grounds are employed for one or several alarm boxes. That any such ground as driven pipes or other buried ground be below permanent moisture level, or at least 10 ft. deep, and in places where added moisture results from the nature of the location, such as lawns, hollows, etc.

(3) That grounding be done to any metal part of box or to parts within box which can be touched without opening inner case.

(4) That, to permit of such effective grounding without prejudice to the alarm service of the system, all alarm and signal boxes be initially tested at the factory with break-down voltage between current-carrying and accessible metal parts of 10,000 volts (analogous to A. I. E. E. requirements for distributing transformers).

In the discussion Dr. Steinmetz indorsed the recommendations in general and particularly noted the break-down test as a relative and moderate initial precaution to delay break-down until protective arresters may if possible relieve the strain. Others brought out the fact that lightning has frequently destroyed ungrounded boxes, the lack of ground proving not to offer the previously presumed protection. The fact that a wood pole or post is, when wet, a ground of high resistance, sufficient to bring strain on box insulation and insufficient to protect human beings, was also emphasized.

Work of Fire Underwriters

The session concluded with a short address by Mr. C. H. Lum, assistant general manager of the National Board of Fire Underwriters, on "The Work of the National Board of Fire Underwriters."

Mr. J. E. Latta, as representative of the National Fire Protection Association, emphasized the non-commercial character of that association and urged that from the nature of their relations to their municipalities the members of the International Association of Municipal Electricians should be especially interested in fire protection.

Electrolysis

The report of the committee on electrolysis, presented by Mr. Arbuckle, of Bayonne, N. J., gave a short summary of the present status of various methods proposed for abating damage from earth current.

A paper by Mr. J. M. Perkins, arriving at much the same conclusions and referring frequently to the results and studies of the National Bureau of Standards, was also read before the subject came up for general discussion.

In a paper on "Cost of Street Lighting," by Mr. Harry Holtz, of Philadelphia, the increased cost per lamp with

underground systems was noted, and the cost variation with power source in steam plant, water plant or water plant with steam reserve was discussed at some length.

Overhead-Line Construction

One of the subjects of wide interest to the convention was the character of overhead construction. After the reading of a paper on "Standard Construction for Fire Alarms and Police Circuits," by Mr. C. S. Downs, of Altoona, Pa., the report of the committee on high-voltage overhead construction was presented by Mr. A. L. Pierce, Wallingford, Conn. As representing the first concerted action which has been taken by municipal representatives looking toward the adoption of a standard which shall adequately protect the public and promote progress in the industry, this report has aroused considerable attention.

Following the report, Dr. Steinmetz in discussing the recommended rules suggested careful consideration by a standing committee of all future additions to the rules, so that mistakes could be avoided and each step be a forward one. He spoke further of the great possibility and opportunity for municipal electricians, since their police power makes possible the rejection or acceptance of any specification offered by utility companies or engineers and the city representative alone represents the whole public in his community. In conclusion, Dr. Steinmetz suggested that the design fell naturally to the operator, and that performance and results were the objects to be sought in a standard for construction developed by the city's representatives or submitted for their approval. Considerable further favorable discussion of the proposed recommendations was participated in by Messrs. J. B. Yeakle, Baltimore; J. W. Kelley, Camden; C. W. Pike, Philadelphia; A. L. Pierce, Wallingford; W. J. Canada, Washington, and others. Mr. W. T. Oviatt, chairman of the National Electric Light Association overhead-line committee, who was present, was also invited by President Kelley to make some remarks. Mr. Oviatt stated that the suggested rules appeared satisfactory and believed that within a year his committee would develop rules for separation, strength of construction and other factors of overhead construction which could not fail to meet the approval of the municipal electricians. He commended also the spirit of co-operation and the lack of haste shown by the committee in reaching its conclusions.

Upon motion of Dr. Steinmetz, a vote of thanks was given to the National Bureau of Standards and to Mr. W. J. Canada, its electrical engineer, who drew up a material part of the committee recommendations as adopted. Future co-operation of the National Bureau of Standards was also requested.

The concluding paper, "Temperature Coefficiency in Cable Testing," was presented by Mr. Leo Firman, of Philadelphia. Some results of tests conducted by Mr. Firman for the Philadelphia Electrical Bureau were given, from which a serious inadequacy of coefficients for insulation given in existing tables would seem to be shown. A new coefficient is being used by the Philadelphia Bureau, and the advantage of thorough investigation of the subject by the Bureau of Standards was suggested by Mr. Firman, so that all municipalities may have reliable data available for use in purchasing cables.

Officers for the ensuing year were elected as follows: President, Mr. W. H. Flandreau, city electrician, Mount Vernon, N. Y.; first vice-president, Dr. C. P. Steinmetz, consulting engineer, Schenectady, N. Y.; second vice-president, Mr. R. J. Gaskill, city electrician, Fort Wayne, Ind.; third vice-president, Mr. C. E. Convers, San Antonio, Tex.; secretary, Mr. C. L. George, Houston, Tex., and treasurer, Mr. C. E. Diehl, Harrisburg, Pa.

CONVENTION OF ILLUMINATING ENGINEERS

Approved Solutions of Lighting Problems Suggested—Developments in the Science of Illumination and in the Lighting Industry Discussed

More than 200 persons, including a number of ladies, registered at the eighth annual convention of the Illuminating Engineering Society held at the Hollenden Hotel, Cleveland, Ohio, Sept. 21 to 25. Mayor Newton D. Baker, the Cleveland chief executive whose "three-cent electricity" propaganda has attracted wide interest, delivered the address of welcome. Without entering upon local controversial topics, Mayor Baker commented broadly on the moral lessons of the European conflict and pointed out that materialistic progress cannot be substantial without the spiritual advance of civilization. He urged every man to prosecute diligently his own special work or duty, but not to be unmindful of the larger affairs of government with which every good citizen should keep in touch. Prof. G. A. Hoadley, Swarthmore, Pa., responded on behalf of the society.

President Bond's Address

President C. O. Bond in his address took up first the internal work of the society, discussing the success of the plan of holding chairmen of committees responsible to the general council but allowing each chairman to name his own committee. Passing to the future activities of the organization, President Bond pointed out that the Illuminating Engineering Society has not yet supplied criteria for standards of good illumination, as, for example, approved solutions of the problems of lighting typical dwellings or offices. On such an approved solution the whole society could unite. A step in this direction, however, is the new illumination designed for the council room of the society at New York, which it is planned shall represent the very best practice in the artificial lighting of an office. But without the acceptance of some approved standard by illuminating engineers themselves, said President Bond, doubt on the part of the general public with regard to illumination affairs is only to be expected. That after eight years of activity the I. E. S. has neglected to take any steps toward adopting standards of illuminating practice has been due, said Mr. Bond, not so much to lack of information available as to lack of courage.

The society, he went on, should also seek wider and more diffused publicity concerning its work, aims and purposes. Many of its papers are of such general interest that if condensed and popularized they would prove widely acceptable for publication in the general magazines and in the popular press. An attractive children's primer covering the points of elementary lighting hygiene might also well be prepared and a copy hung in every schoolroom. There are some 18,000,000 school children and 600,000 teachers in this country, and through them a large part of the general public could be reached and educated in matters of proper lighting. More sustaining memberships should also be obtained from municipalities, educational institutions, endowments, etc., said the president. Already the I. E. S. is taking a practical part in contributing to the protection of the health of the public in the investigation of matters having to do with eye strain and the conservation of vision. In closing, President Bond announced the formation of an illuminating engineering society in Japan, and deplored the effect of the war in Europe on the activities of the sister organizations of the I. E. S. in England, Germany and France.

Messrs. C. H. Sharp, New York; J. R. Cravath, Chicago, and G. S. Barrows, Philadelphia, were named as the committee on the president's address, and Messrs.

M. G. Lloyd, Chicago; L. B. Marks, New York, and L. B. Eichengreen, Philadelphia, were appointed to act as the committee on resolutions.

Work of the Research Committee

Prior to the reading of the report of the committee on progress by Mr. F. E. Cady, Cleveland, Ohio, a brief résumé of the work of the research committee was presented by Dr. H. E. Ives, Philadelphia. The fourteen members of the 1914 committee were chosen from one community (Philadelphia), but they represent many diversified branches of lighting science, there being also included among the number four ophthalmologists, one physiologist and two psychologists. Informal laboratory meetings have been held on Saturday afternoons following luncheons, and at the close of the discussions reports of the proceedings are prepared by the chairman and submitted to the members for criticism. After revision there reports are presented to the society for publication in its transactions. Dr. Ives recommended that a similar plan be adopted next year, the members of the research committee to be chosen from some other one city or vicinity, so that the members might meet frequently for discussion.

Progress in Lighting

The committee on progress, of which Mr. F. F. Cady was chairman, submitted a report relating to the development in the science of illumination and in the lighting industry. The subjects dealt with were gas lamps and appurtenances, electric incandescent lamps, arc lamps, vapor and vacuum-tube lamps, lamps for projection purposes, street lighting, exterior illumination, interior illumination, photometry, illuminating engineering societies, the International Illumination Commission, reflection, physiology, legislation and literature. The report consisted of well-edited abstracts of articles which appeared during the past year in journals devoted to illumination, the material being arranged in logical order to show the relation of each development to the others and the general trend of progress.

The Color of Illumination

In a paper by Mr. L. A. Jones much information was given concerning the quality of the light emitted by various lamps compared with sunlight as the standard for color. The standard was taken as direct sunlight reflected from a non-selective surface, magnesium carbonate. A summary of the results is given in the accompanying table.

COLOR AND WAVE LENGTH OF DOMINANT HUE

Source	Per Cent White	Hue
Sunlight	100	....
Average clear sky	60	472.0
Standard candle	13	593.0
Hefner lamp	14	593.0
Pentame lamp	15	592.0
Tungsten glow lamp at 1.25 w.p.c.	35	588.0
Carbon glow lamp at 3.8 w.p.c.	25	591.5
Nernst glower at 1.50 w.p.c.	31	586.7
Nitrogen-filled tungsten at 1.00 w.p.c.	34	586.0
Nitrogen-filled tungsten at 0.50 w.p.c.	45	584.5
Nitrogen-filled tungsten at 0.35 w.p.c.	53	584.0
Mercury-vapor arc	70	490.0
Helium tube	32	598.0
Neon tube	6	605.0
Crater of carbon arc at 1.8 amp.	59	584.6
Crater of carbon arc at 3.2 amp.	62	584.6
Crator of carbon arc at 5.0 amp.	67	583.4
Acetylene flame (flat)	36	585.5

In determining the relative color values use was made of a colorimeter of the Nutting monochromatic type. The principle involved in the monochromatic method is that any color can be matched by the mixture, in proper proportions, of white light with monochromatic light of the required wave-length. The wave-length of the monochromatic light that is necessary to make the color match is known as the wave-length of the dominant hue and is expressed herein as $\mu\mu$. The intensity of the white light expressed as a percentage of the sum of the intensities of the pure hue and white mixed together to match the color being analyzed is known as the "per cent white." The author stated that the precision obtainable in a single reading is of the order of $\pm$ 3 per cent in the per-cent-white reading and $\pm$ 0.5 $\mu\mu$ in the wave-length of dominant hue. By taking a number of observations any probable error can be greatly reduced.

Discussion

Mr. W. R. Mott, Cleveland, Ohio, opened the discussion of Mr. Jones' paper with a mention of the Bloch standard used in Germany. He declared that sunlight must become a secondary standard when skylight is employed as the reference. He also discussed the possibilities of the flame arc as a standard source of color. Dr. H. E. Ives, Philadelphia, Pa., pointed out the difficulty of comparing white with pure spectrum colors, and declared that the method proposed substitutes a comparison which is indefinite for one which, though arbitrary, is nevertheless fixed and definable. Mr. M. Luckiesh, Cleveland, Ohio, commented that the Jones method seemed to him philosophically superior, but he called attention to discrepancies in the results obtained by various observers. Mr. J. B. Taylor, New York, also questioned whether two observers could duplicate results closely. Dr. C. H. Sharp, New York, objected strongly to the expression "watts per candle" used by the author in designating efficiency.

Other Activities of the Week

The other papers read and discussed at the session last Monday afternoon were "Artificial Daylight—Its Production and Use," by Messrs. M. Luckiesh and F. E. Cady, of the National Lamp Works of Cleveland, and "Development of Daylight Glass," by Mr. E. J. Brady, of the United Gas Improvement Company of Philadelphia. Abstracts of these papers, as well as of the other papers presented at the technical, commercial and laboratory sessions, together with the gist of the discussions to which they gave rise, will be published later in these columns. Almost every phase of artificial and natural illumination was provided for on the program, and the intricate problems incident to accurate photometric work were taken up by a number of authors in the laboratory sessions.

Entertainment Features

The entertainment program and general convention arrangements of the I. E. S. meeting at Cleveland were unusually complete. A handsome souvenir program contained abstracts of the various papers and also scheduled the technical sessions and numerous entertainment features. On Monday evening there was a reception and ball at the hotel. On Tuesday afternoon inspection parties were piloted to various Cleveland industries, and in the evening there were popular lectures on photo-sculpture and color photography. On Wednesday night the annual banquet was held, and on Thursday the convention delegates were entertained at Nela Park, dinner being served at Camp Nela. During the sessions a number of pleasing automobile rides, teas and card parties were arranged for the entertainment of the visiting ladies.

PACIFIC COAST MEETING OF A. I. E. E.

Subjects of Special Interest to Western Public Service Corporations and Engineers Discussed at Spokane, Wash. —Inductive Interference Order of California Commission Criticised

The Pacific Coast meeting of the American Institute of Electrical Engineers and the annual convention of the Northwest Electric Light and Power Association were held in the Hotel Davenport, Spokane, Wash., Sept. 9, 10 and 11, with joint and parallel sessions.

Entertainment was provided throughout the convention period, beginning with an informal reception at the Hotel Davenport on Sept. 9, with automobile trips to nearby resorts and the Country Club and theater parties. On the evening of Sept. 9 a Dutch lunch was held jointly by the two associations, for the principal purpose of permitting the delegates to become acquainted, and on the following evening Mr. A. H. Halloran, of the *Journal of Electricity, Power and Gas*, gave an illustrated lecture on the electrical features of the Panama-Pacific Exposition. On the evening of Sept. 11 a joint banquet was given to the delegates, Mr. O. B. Coldwell, of Portland, Ore., being toastmaster. President P. M. Lincoln of the Institute, Mr. R. Pope, Mr. A. H. Halloran and Mr. N. Brockett spoke in a happy vein. On Sept. 12 and 13 large numbers of the delegates visited the Long Lake power station under construction by the Washington Water Power Company and took an inspection trip over the single-phase railroad of the Inland Empire Railroad Company, finishing the entertainment features with a dinner at Hayden Lake, Idaho.

The joint convention was called to order Sept. 9 by Mr. H. L. Bleecker, Mayor Hindley of Spokane then welcoming the delegates to the city, after which Mr. Norman Brockett replied to Mr. Hindley on behalf of the joint convention.

The two bodies reconvened separately after the joint session. The report of the A. I. E. E. meeting follows. The deliberations of the Northwest Electric Light and Power Association will be published in a subsequent issue.

Immediately after the joint opening exercises, the sixth Pacific Coast meeting of the A. I. E. E. was called to order by Mr. J. B. Fisken, who dwelt on the past work of President P. M. Lincoln in regard to the sections, thereby enabling a Pacific Coast meeting to be held, notwithstanding the great distances between sections.

Transformer Wave-Forms

In a paper entitled "The Effect of Delta and Star Connections Upon Transformer Wave-Forms" Mr. L. F. Curtis described tests made with the oscillograph to show the no-load exciting current and voltage waves of three single-phase, 10-kw, 1100/110-volt, sixty-cycle step-up transformers, when the windings of the generator and both sides of the transformers were connected in all possible symmetrical delta and star relations. A 7.5-kw generator was used. The tests were divided into four groups, according to the connections of the generator, and in all cases normal low-tension line voltage was maintained. The author pointed out that the best voltage forms will, in general, be obtained with a star-connected generator and delta-star or star-delta connected transformers.

Discussion

This paper was discussed by President Lincoln, Mr. Corbett, Mr. Miller, Mr. Robinson, Mr. Geary, Mr. Merwin, Mr. Ferris and Professor Carpenter.

President Lincoln, in opening the discussion, brought out the conception of the floating neutral rotating around the true neutral of a three-phase transformer, at a velocity of three times the fundamental wave, when considering problems of third harmonic waves. The general discussion had a decided trend to the measurement of wave-forms, and Mr. Ferris described the method devised by the California joint committee on inductive interference to exaggerate the wave-form where higher harmonics, beyond the ordinary range of the oscillograph, were to be studied. This was accomplished by leading the current to be measured through a suitable air-core inductance and resistance, with a shunt of a condenser in series with the vibrating strip. The discussion also touched upon the practical experiences with delta-connected and star-connected high-tension transformers on transmission systems.

Hydroelectric Development at Big Creek

Mr. Edward Woodbury read a very interesting paper on some operating conditions of the 150,000-volt transmission system of the Big Creek development of the Pacific Light & Power Corporation, of Los Angeles, an abstract of which paper will be published in a later issue. Interest in this development, which stands in the forefront of high-tension transmission work, is keen, and the contribution made by Mr. Woodbury dealing with operating features was listened to with great interest.

Discussion

Mr. Woodbury read part of his paper, abstracting the appendices, bringing out a number of interesting sidelights on the operating experience on this notable installation. The paper was quite extensively discussed by President Lincoln, Mr. Harrisberger, Mr. Fisken, Mr. Fraser, Mr. Miller, Mr. Geary, Mr. P. N. Nunn and Mr. Trenner, Mr. Woodbury closing with answers to the numerous questions brought out by previous speakers. Mr. P. N. Nunn gave an interesting comparison of the early developments of transmission systems with the progress of this art at this date, as shown by Mr. Woodbury's paper. He described the work begun in 1890 of transmitting at 3000 volts, then the highest operating voltage, and carried the story of development up to the present-day high-tension systems. He touched on a number of very interesting details in connection with the changes that were made in construction and operation, and his remarks were received with special attention at this meeting. The operation of this system was discussed to some extent, and the successful regulation of the long high-voltage lines by means of 15,000-kva rotary condensers received consideration.

Transmission and Distribution Construction

Some of the details of transmission and distribution construction employed by the Western Canada Power Company, Ltd., Vancouver, B. C., were described in Mr. F. D. Nims' paper on "A Distribution System for Power Purposes." Steel-core aluminum cables and hemp-center stranded-copper conductors are employed on this company's 60,000-volt circuits. On wooden-pole lines saddle-type pins are used so that the cross-arms do not have to be weakened by boring holes to accommodate the ordinary type of pin. On one of the steel-tower double-circuit lines where the conductors are arranged in two vertical planes the middle cross-arms were extended to prevent the conductors coming in contact when loaded with sleet and snow.

All of this company's 12,000-volt circuits are supported on wooden poles. When two or more circuits have to be run between the same points each one is supported on its individual pole line, the several circuits being carried over different routes to avoid service interruption. No substations are maintained for distributing purposes along the line. Where energy is required

along the route outdoor-type transformers and oil-break switches (or pole-type or combination fuse and disconnecting switches) are mounted on poles. In some cases indoor-type water-cooled transformer installations are employed, which are protected by galvanized-iron sheeting.

Distribution in Vancouver and New Westminster is effected by means of steel-taped lead-armored cables laid directly in the ground without protection except under railway tracks or busy streets where wood ducts are used. Transformers for city distribution are either installed in vaults or on poles. In the latter case the high-tension cables extend to the top of the pole, where they terminate in outdoor-type potheads. The cables are protected up to 10 ft. above ground by an inclosing pipe. Underground installations of this character cost about $6,483.84 per mile of cable, not including overhead or engineering expenses.

Discussion

The discussion was opened by Mr. Fisken, who questioned the installation of this system in other than residential districts. President Lincoln brought out the matter of locating faults in steel-armored cable as described in this paper, and made some observations regarding the heating of large cables in heavy duct lines of ordinary construction, and the relief from this to be expected from steel-armored cables laid separately in the earth. Mr. Rohrbach discussed the question of costs at some length, by comparing the costs given in Mr. Nims' paper with those available on ordinary tile and fiber duct construction. Mr. MacCalla recited some experiences in Sydney, Australia, some years ago, where electrolysis had practically destroyed the armored cable before service was actually begun. Mr. Carpenter discussed further the location of faults in steel-armored cable by ordinary methods. Mr. Woodbury, Mr. Rosenblatt, Mr. Harrisberger and Mr. Corbett discussed the features of transformers and 60,000-volt lines which had been included in the general description of this system. Mr. Lebenbaum discussed the merits of the three-conductor sector-type cable in this type of underground system. Mr. Nims, in closing the discussion, emphasized the point that for conditions under which this system was installed (Vancouver, B. C.) up to four cables the steel-armored cable was cheaper than the duct system.

Electricity in the Lumber Industry

Mr. E. F. Whitney's paper entitled "Electricity in the Lumber Industry" contained a description of applications of electrical equipment to logging and milling operations. In spite of the large amounts of refuse available for fuel, several sawmill companies in the Northwest are using central-station energy exclusively. The author pointed out that the largest field for electrical apparatus in the lumber industry is in logging, which includes felling, gathering and loading of trees. Portable equipment used for this purpose by the Potlach Lumber Company was described. Data were also given showing the costs of logging to be $10.88, $16.54, $17.13 and $20.93 per day when handling 76,200 ft. (board measure) of lumber per day, using electricity, oil, coal and wood respectively. An analysis of log-hauling operations showed that electricity could be used to advantage. Maintenance and operating expenses for electric and steam-hauling equipment under typical conditions bear the ratio of three to four approximately. Where hand stacking is employed two men can rarely handle more than 10,000 ft. of lumber, but with a simple electrically operated stacker driven by a 12-hp motor the same number of men can handle 50,000 ft. per day. An unstacker operated by a 5-hp motor will take care of 60,000 ft. per day. It was pointed out that squirrel-cage induction motors are employed to drive mill machinery where possible, semi-group drive being employed almost entirely. The equipment has to be designed generally for the maximum output as the load fluctuates considerably. The duty of log carriages is severe, as the retardation at the end of travel and the acceleration of return must be exceedingly high to prevent loss of productive time.

Discussion

Mr. Whitney's paper was discussed at great length by Messrs. Scott, Miller, Weber, Fisken, Merwin, Cheek, Norman, Fraser and Harrisberger, covering numerous phases and details of this application of electric power. Mr. Whitney closed the discussion, covering at length various points brought up. This paper will be of undoubted value to the lumbering industry, as well as to the engineer, in showing what has been accomplished.

Electric Versus Steam Locomotive Operation

In a paper on the "Electric Operation of the Butte, Anaconda & Pacific Railway," Mr. J. B. Cox compared the operation of steam and electric locomotives. Considerable valuable data were included, showing the decrease in overtime work, the increased tonnage per train, the fewer number of trips required, the increased running speed, and the relative maintenance and operating expenses. Comparing operations in June, 1913, and June, 1914, there were 25 per cent fewer trains required and 35 per cent more tonnage hauled per train with electric locomotives than with steam. The saving from partial electrification was more than $150,727 a year for energy alone. The total saving in electrification was about $237,581 a year, while the traffic has been increased about 9 per cent over what it was with steam operation. A saving in trainmen's wages of $31,146 a year has been effected. Other expenses have also been reduced as follows: Repairs, 26 per cent, and engine-house expenses, 38 per cent. The total cost of electrification was in round figures $1,201,000, making the total net savings about 20 per cent of the investment.

Discussion

Mr. Cox's paper had not been received in time to be printed for this convention, and therefore, while the reading of it invoked considerable discussion, the discussion was not so general as would naturally be expected on this subject. Mr. Lebenbaum opened the discussion, referring particularly to experience with various types of pantograph trolleys and the final adoption of the roller type of bearings. Mr. Kohler raised the question of reliability of six months' service costs upon which to base conclusions, because of having smaller maintenance charges when equipment is new, making reference to steam-locomotive experience in regard to this feature. Messrs. Miller, Ralston and Stacy also discussed the subject, and Mr. Cox in closing added materially to the information given in his paper on constructional features and actual operating experience.

Motors for Dredges

In his paper entitled "Application of Electric Motors to Gold Dredges" Mr. G. B. Rosenblatt declared that electric energy has been applied quite universally of late to the driving of gold dredges. Of the $88,400,000 worth of gold produced last year in the United States, nearly a fifth came from gold dredges. The elevator dredge is the most commonly used for gold mining. Energy is required at the digging and primarily for driving the bucket chain, although some energy is also needed for lifting and lowering the ladder and for operating the devices that pull or hold the dredge up

against the bank so that the buckets will bite into their work. The duty of the motors is similar to that for ordinary hoisting service. Alternating-current motors are generally used. For small motors the drum-type controller is employed, and for the larger machines the liquid rheostat provides the best control.

Discussion

Mr. Rosenblatt read his paper with frequent observations on the subject matter, dwelling particularly on the difficult motor application known as "stocker motor." A written discussion by Mr. F. W. Harris, Los Angeles, was read, which discussed Mr. Rosenblatt's paper very fully, more particularly, however, with reference to California conditions. Messrs. Ross and Armstrong discussed the general subject from the mining engineers' viewpoint. Mr. Pope covered his recollections of early days in the gold fields on the Fraser River, British Columbia. A written discussion by Mr. W. M. Shepard, of San Francisco, was read, which made special reference to the question of a squirrel-cage versus a wound-rotor induction motor for driving the stocker. The problem of motor application to this work was extensively discussed.

Operating Characteristics of Insulators on 55,000-Volt Lines

In a paper entitled "Economy in the Operation of 55,000-Volt Insulators" Mr. M. T. Crawford gave a brief outline of operating experiences on three 55,000-volt lines, two of which have been in service ten years and one five years. The insulators originally installed on Line A were among the first of their kind and voltage to be made. The manufacture of high-voltage ware was not well understood at that time, and electrical failures began to occur soon after installation. It has been necessary gradually to replace these insulators. On Line B insulators of a better grade were used, although they cannot compare with the ware turned out by manufacturers nowadays. Until recently these insulators held up quite well. On Line C the best type of insulators were used and each unit was thoroughly tested. Up to now there have been only three failures. The author described a device by means of which defective insulators can be readily detected in the early stages of deterioration; by periodic use of this device and replacement of insulators failures in service have been practically eliminated.

Discussion

Mr. Harrisberger made a few remarks concerning the causes which lead up to the features of testing insulators described in Mr. Crawford's paper. He also made special reference to the danger of cementing iron pins onto the high-tension insulators, and covered the practical conditions of training linemen to test insulators in the manner described in the paper. Messrs. Geary, Miller, Noack, McCormick and Merwin discussed the troubles with insulators, Mr. Noack covering more especially what is generally called "aging of insulation." He questioned any molecular change in porcelain, but instead described the effects of external forces, such as expansion and contraction due to changes in temperature, when the porcelain is used in conjunction with cement, iron, steel and other materials. Mr. Pope brought out the question of use of glass for high-tension insulators and referred to information on this subject previously given in the *Proceedings* of December, 1912. Mr. Geary and Mr. Ross also touched on the subject of using glass for high-voltage insulators.

Mr. Fraser and Mr. Woodbury spoke concerning the insulator tests, and Mr. Harrisberger closed the discussion, replying to some of the questions asked by others who had taken part in it.

Inductive Interference

The Friday afternoon session was devoted to the report by the joint committee on inductive interference to the State of California, which was presented by Mr. L. P. Ferris. (For order of commission see *Electrical World*, Sept. 5.)

The reading and discussion occupied the whole afternoon session and was listened to with undivided attention by a large audience.

The president called upon Mr. P. N. Nunn to open the discussion, and Mr. Nunn reviewed the report very fully, bringing out that, notwithstanding the fact that the scientific investigation deserves attention, there is still another aspect to this matter. The report comes also "as the announcement of a matter of public policy, an arbitrarily enacted law adopted by a commission of one of the largest states, presumably having in mind a somewhat similar action upon the part of other states; therefore this, as an enactment by the Railroad Commission of California, stands before us as a probable restrictive piece of legislation upon those developments which are involved in this investigation. Read casually, it is a surprise to find the extent to which the traditions and practices of power companies are discussed, modified and overruled; read more carefully, there appears a broad-minded equity running through it, a cooperation between the different interests involved; read still further, one finds evidences of a far more serious nature, a matter of hardship. The rules laid down are not superficial; on the contrary, they are subtle. The effect of the various provisions presented is not apparent upon casual reading, but it will bear thinking out."

Mr. Nunn went on further to point out that the right to waive substantially all the rules laid down was given to the communication companies. He also complained that "at crossings and other unavoidable cases of close proximity the power line shall be kept above the communication line and constructed in conformity to the National Electric Light Association's specifications." Regarding transpositions, he brought out that the communicating companies were sole judges of the number, type and locations. The requirements for oil switches were also discussed, as well as the prohibition of air switches. Mr. Nunn, in closing his extended and caustic review of this report, said: "Throughout it is eminently reasonable and mild in its wording, but from first to last it, of course, seeks to establish and fix the responsibility. It is an enunciation of principle—principle which it does not find the way to carry out, which it is unable to define, which it is not for a moment in a position to step forward and urge to be carried out in definite terms; but it fixes the principle that these things ought to be done if they can be done. If that were established here before a technical society or before the N. E. L. A., it would be interpreted in a different manner. At all events, in the light of what I know of this subject, it is my personal opinion that as a legal document this is very skilful, very, very far-reaching, of importance which entirely overshadows its immediate technical value to us."

Mr. Halloran read a written discussion by Mr. A. J. Bowie, Jr., showing that under certain conditions switching lines with air switches produced less disturbances than when oil switches were used.

Messrs. Fisken, Humphry, Martin, Corbett, Kahler and Merwin discussed individual sections of the report, and also brought out the menace to the power interests caused by any commission adopting such report in the present light of knowledge of the subject. Mr. Ferris closed the discussion by answering a number of the questions raised, whereupon President Lincoln declared the convention closed *sine die*.

Trade Conditions and Opportunities

Different Points of View on the Great Questions and Commercial Possibilities Opened by the European War

WASHINGTON ON EXPORTS AND IMPORTS

Authorities of Department of Commerce and Pan-American Union Caution Manufacturers

The Department of Commerce has finished compiling the totals of exports and imports of the United States for August and is now at work classifying the details. The general figures of exports for the month show a falling off of $77,572,475. The total August exports amounted to $110,337,545, compared with $187,909,020 in August, 1913. For the eight months of the year ended with August the exports were $1,311,319,707, against $1,515,182,157 for the same period last year.

August imports, which include much of the raw material used by exporters of manufactured goods and products, totaled $129,399,496, compared with August, 1913, figures of $137,651,553. In the eight months ended with August this year imports were valued at $1,269,992,869, against $1,156,300,228 in 1913. There is therefore also a falling off in imports for August, including raw material from which products are manufactured for export, of $8,252,057.

It should be borne in mind that some of the import figures are affected by the tariffs and not by the war. Of the August imports, 61.8 per cent entered free of duty, compared with 50.9 per cent in August, 1913.

Because of the wide interest among American exporters in the possibilities of South American trade, the Pan-American Union made public in Washington on Sept. 22 a statement cautioning manufacturers against the belief that there is a great market for the actual sale of products of the United States in Latin America at this time. Cable inquiries were sent by the Pan-American Union to thirty-four of the capitals and commercial centers of South and Central America.

"The responses," the Pan-American Union states, "show that it is important both to these countries and to the United States to sound this note of caution.

"What the business interests there now need is not so much manufactured products or additional ships as active financial help in the form of necessary money advances, reasonable credits and an actual market for their raw products, which usually go to Europe. The real Latin-American opportunity is more one for cooperation, investigation and preparation."

In these views the Department of Commerce, through Secretary Redfield, coincides.

Mr. Redfield announces that the department "will shortly place in Rio de Janeiro, Buenos Aires, Santiago and Lima commercial attachés, speaking the language of the country to which they are sent, and who will be instructed to make continued studies of the markets for the benefit of American industries."

Mr. Redfield sums up conditions in Latin America as follows:

"Credit is shaken or has for the time passed away. The course of exchange has been broken with no new one yet to replace it. The result is that while the ultimate purchasing power of South America has not been impaired, her present buying power and her resources of current credit are seriously and adversely affected. Her first and foremost need, therefore, without which she cannot buy largely, is to have re-established her basis for credit. Without this credit merchants and manufacturers in this country cannot afford to sell; without it Latin America cannot buy."

SOUTH AMERICAN TRADE OPPORTUNITIES

Conditions to Be Kept Clearly in Mind if Export Business Is to Be Secured

BY DAVID KINLEY*

In our efforts to secure the South American trade opened to us by the war in Europe we must keep clearly in mind certain conditions of success. We must be able to offer goods similar in kind and amount to those whose supply is cut off; we must be ready to take in exchange the products of our South American neighbors, and we must be able to finance the projects of the countries we wish to enter, if we would make our entry into this trade permanent.

In 1912 the United Kingdom, Germany and France together exported to the ten South American republics an aggregate of $435,000,000, distributed as follows: United Kingdom, $244,972,000; Germany, $136,060,000; France, $53,853,000; total, $434,885,000. In addition a considerable amount was taken from Belgium and Austria.

Of this trade, that from Germany, Belgium and Austria-Hungary is wholly cut off, while that from France and Great Britain will undoubtedly be considerably reduced. The figures serve, however, to show in a rough way the extent of the market opportunity.

But we cannot judge how much of this market we can capture without considering the nature of the articles traded in. Taking the markets of Argentina as an example, we find that in 1913 she imported $34,000,000 of food products and $89,000,000 of textiles and textile manufactures, of which $41,000,000 were cotton, $16,000,000 wool, and the rest other textiles. In addition, she took from other countries $23,000,000 worth of oils, grease, etc., $14,000,000 of it being in kerosene, naphtha and similar products. In iron and steel and the manufactures of the same the aggregate imports were $50,000,000; of railway cars, autos and railway carriages, $37,000,000; of building materials, $35,000,000; of earths, stones, glass, coal, etc., $36,000,000, and of electrical apparatus, $10,000,000. These are the largest items, and most of them will appear as the largest items in the imports of the other South American countries. Evidently they are things which we can supply if we can increase our production sufficiently. Our present cotton crop is proving a source of financial embarrassment, yet if our mills were able to take it up and manufacture it into cloth we should be able to fill the South American gap in a very large measure. The fact that it is not being bought by our mills illustrates one of the limitations under which we work. That is, that to supply so large a market a tremendous increase of our industrial capital is necessary, and this cannot be suddenly made.

Now to build up a trade we must not only be able to supply our South American neighbors with the things we manufacture, but we must be ready to take in exchange the things which they are accustomed to sell to Europe. We must be ready to take coffee from Brazil, Costa Rica and elsewhere, and cocoa from Ecuador. Bolivia is looking for another new market for her tin, of which 40,000 tons are said to be waiting for ship-

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ment now. Chile offers us minerals of various kinds, Peru has a variety of articles, but the most important of her present exports is nitrates. A good many of the exported articles are raw materials and food which we produce ourselves in sufficient quantity for our own consumption. We cannot step in and replace the demand of Germany, England and France for Argentine corn, wheat and meat. Hence it is clear that our new trade will be limited as much by the extent to which we are ready to buy their goods as by the extent to which we are able to supply our own.

We must remember, too, that a considerable portion of the goods exported from South America to Europe is to pay interest on European investments in that country and is not in exchange for current products. In so far as this is true we cannot trade in those goods. To be sure, we have lost some of our market in Europe, and what would normally go there may be diverted to South America in addition to new extra products that we can rapidly turn out. Nevertheless, when all limitations are allowed for, the market open to us in South America on account of the war is a tremendous one and very much larger than we shall be able to supply.

Some Conditions of Success

As just remarked, a considerable proportion of South American exports represents interest on indebtedness. In other words, England, France and Germany have built up their great South American trade largely by financing South American enterprises. If we are to replace any or all of these countries in the future, we must furnish capital. This is particularly true in the west-coast countries, whose mineral resources are awaiting a larger development than they have yet had. If we can loan South American enterprises sufficient capital, we shall get the trade which these enterprises develop. For example, if a group of American financiers should advance $50,000,000 for railroad or mining enterprises on the west coast, they would not send gold to these countries. They would give the proper parties credit for the amount, and these parties would then purchase in this country the materials and other supplies necessary for the enterprise. They would pay for these by drafts on the credits which had been advanced to them. In due time, after their enterprises were under way and successful, they would pay the interest and the capital on their loan from the proceeds of their exports to this and other countries. It is obvious, then, that the financing of enterprises down there leads to an increase of exports from the country which does the financing. It is true that we can build up our trade to a considerable degree without financing enterprises, but we can never hope to get the large bulk of the business. For to trade with the people of an undeveloped country without financing them means simply to sell our products for theirs. But they have few products to sell unless they can get capital to make them. The more capital they can get the more they have to sell, and the more, therefore, they are able to buy. This process accounts for the great hold of the English and Germans in Argentina and Chile. There is a considerable field still open in these countries. But we should have an easier time in Peru, Ecuador, and possibly in Brazil.

There is too much talk of government initiative in this matter. We cannot build up trade by writing about it or talking about it, or by determining that "this country" must do business with some other country. Countries do not trade. Business firms and individuals trade. If, therefore, any manufacturer or group of manufacturers is in earnest about developing trade with South America, he must proceed on his own initiative. He should send sensible, responsible agents at once to report upon the conditions under which business can be done. He should find the usual terms of credit, for the conditions and methods of doing business, particularly in granting credit, are not the same in all these countries in all lines of business. These agents should report exactly what articles the people have been accustomed to buy and what they want in style, quantity, colors, prices and other details. The manufacturer should then endeavor to meet the wishes of his prospective customers in all respects. All this implies what a recent manufacturer has called a "network of intelligent agencies."

Moreover, it will be necessary to make reasonable conditions about payment. Consequently we must have better banking connections than we have ever had with South America. We must have banking agencies that will make it possible to establish credits in New York and Chicago to be drawn against by exporters and importers. These banking agencies can also be utilized for financing development. But they must be made to serve the people there and not be treated as simply an extension for our own profit by exploiting our customers. They must do banking business in South American ways and according to South American conditions.

Shipping

A good deal has been said about the need of shipping facilities. A careful study of the situation will show, I believe, that direct shipping connections have been lacking because we have not had the trade rather than because of the lack of vessels. In the past a considerable proportion of the vessel space from New York to Buenos Aires, for example, is said to have returned in ballast. There is less need for anxiety on the score of shipping than some people seem to think. Nevertheless, we should make an immediate and determined effort to get lines of ships within American control. We and the South Americans need our own lines of steamers to do our business, if for no other reason than to avoid preferential treatment of European exporters by European shipping.

MANUFACTURERS' EXPORT DISCUSSION

Business Men and Representatives of Department of Commerce on South American Trade

The American Manufacturers' Export Association held a lunch at the Whitehall Club, New York, on Sept. 18 to discuss foreign trade conditions. Mr. Charles E Jennings, the president, presided.

The first speaker was Mr. H. N. Douthitt, special agent of the Department of Commerce, who is to go soon to South America to investigate the trade possibilities for American manufacturers of electrical machinery and other kinds of machinery.

Mr. Charles M. Muchnic, third vice-president American Locomotive Company, spoke of erroneous ideas in regard to South American trade possibilities. He said that in view of the deplorable financial conditions in South America the opportunities open to American manufacturers at this time are to lay foundations for future returns.

Mr. William A. Graham Clarke, commercial agent in charge of the Bureau of Foreign Commerce in New Orleans, discussed the serious conditions arising from the lack of mills here to make cotton goods.

Prof. Guy Edward Snider, of the College of the City of New York, who has just returned from South America, spoke of the acute financial situation there.

Mr. J. J. Teal, of the Lehigh Valley Railroad, told of the plan of that company to send a special train from New York to Buffalo to advertise export trade.

AS MANUFACTURERS VIEW THE OUTLOOK

Business Prospects Give Grounds for Expectation of Reasonable Confidence in Industry

In accordance with the request of the *Electrical World*, manufacturers have expressed views on the business outlook as follows:

Electric-Stove Business Flourishing

Mr. George A. Hughes, president of the Hughes Electric Heating Company, of Chicago, when questioned on Sept. 9 by a representative of the *Electrical World* on the business outlook, said that both the volume of business and the collections of his company are in a very satisfactory condition. To Aug. 1 business this year was 100 per cent ahead of last year. However, August did not show the same rate of increase, although still described as good. Mr. Hughes thinks that when the warring nations of Europe begin to call for the foodstuffs of the United States general business will improve. In the meantime business concerns should go ahead in a sensible, conservative way, and both business houses and individuals should be impressed with the fact that the hoarding of money is bad. The company has done a large export business in electric stoves and ranges, which have gone to nearly all parts of the world. The war has seriously affected this business, as shipments have been held up on account of the enormous freight charges demanded owing to the risks of war. As soon as the foreign-exchange situation is clarified Mr. Hughes looks for a resumption of export business with neutral countries. While Germany has had the bulk of the South American electrical trade, Mr. Hughes believes that there is a great opportunity for American manufacturers to supply the smaller socket devices. Owing to the rates for electrical energy usually charged in South America, the situation is not so favorable in relation to the export of machinery and consuming devices, which make a heavier demand for energy. Mr. Hughes concluded: "We are going right ahead. Our business has been really surprisingly good considering the situation abroad and at home, and we believe that the end of the year will show that we have done a greater volume of business in 1914 than in 1913. You may put us down as feeling sanguine so far as our individual activities are concerned. We have been buying some of our materials in Europe heretofore, but have made arrangements to supply our needs in the United States."

Signs Point to Constructive Effects

Mr. J. G. Splane, vice-president Detroit Insulated Wire Company, Detroit, Mich.: "At present it is impossible to forecast what effect the European war will have on United States export trade, although all signs point to the constructive side. Up to the present we have been running full time, and the volume of orders coming in is very encouraging for the future. We have been depending upon European countries for some of our raw materials, but fortunately have a stock on hand. It appears to me, however, that substitutes can be found if necessity arises."

Numerous Inquiries from Other Countries

Mr. Thomas Duncan, Duncan Electric Manufacturing Company, Lafayette, Ind.: "Replying to your recent communication asking our opinion as to whether or not the present European war will tend to increase the electrical business of the United States, we unhesitatingly state that such a condition already exists. We have in the past two weeks had numerous inquiries for our meters and transformers from several firms in Great Britain, as well as from nearly every country in South America, which conclusively shows that the business is, by force of circumstances, coming to the United States. As to our being dependent upon European countries for raw materials, we are pleased to report that our needs in this respect have already been met and are now being taken care of here at home."

Business About Normal

Mr. B. H. Howell, president Hemming Manufacturing Company, Garfield, N. J.: "This business is only indirectly affected by export conditions, as owing to the special nature of our work we supply material only to American manufacturers. We have found our business remains about normal. We are able to obtain all of our raw materials in this country."

FACTS ABOUT EXPORT CONDITIONS

Suggestions and Data Relating to Opportunities in Foreign Fields for American Manufacturers

Dr. Albert A. Snowden, foreign trade commissioner of the National Association of Manufacturers, points out opportunities for increased sale of American goods in Australia and New Zealand.

Minister of Foreign Affairs Sazonoff of Russia declares that Russian markets will be open to England and America and that experts should be sent now to study them.

New York bankers are considering efforts to provide for exchange with South America in dollars and cents instead of through London in pounds and shillings.

Two representatives of the American Express Company and the New York Central Lines will go to South America on Oct. 1 to investigate business opportunities.

The First National Bank of Boston, after a canvass, reports in its "New England Letter" increasing optimism by representative New England industries.

The National Foreign Trade Council will hold a convention in Washington during January, 1915.

To promote foreign trade the Bureau of Foreign and Domestic Commerce has opened branch offices in Boston, Mass., and Seattle, Wash.

The Lehigh Valley Railroad sent a South American trade special train from New York to Buffalo this week. The train left New York on Sept. 21. Stops were made at Easton, South Bethlehem, Allentown, Wilkes-Barre, Hazleton, Sayre, Ithaca, Auburn, Geneva, Rochester and Buffalo. At all of these cities meetings were scheduled, at which export possibilities were discussed. The speakers on the train were Messrs. Charles M. Pepper, formerly with the Department of Commerce; Edward Albes, representative of Director General Barrett of the Pan-American Union, and W. S. Kies, in charge of the South American branches of the National City Bank of New York.

REPRESENTATION IN SOUTH AMERICA

Society for Electrical Development Ready to Make Plans for Trip

The Society for Electrical Development, Inc., announces that if a group of its members want to send a special representative to South America to develop trade opportunities it has a competent, experienced electrical engineer for whose services arrangements may be made through the society. This representative, having lived for thirty years in South America, speaking Spanish and Portuguese and having a wide acquaintance, could take charge of the interests of non-competing electrical manufacturers.

PUBLIC SERVICE COMMISSION NEWS

Illinois Commission

The Illinois Public Utilities Commission has granted the request of the Central Illinois Public Service Company, of Mattoon, for permission to change electric-lighting rates in Carthage. It was found that the proposed rates were based upon the tables approved by the commission.

Ohio Commission

In filing its inventory and appraisement, as required by the commission, the Chardon Telephone Company, of Chardon, made the request that the rate for service be made sufficiently large to provide a reasonable amount annually for operation, a certain definite and determined amount for replacement fund annually, and a sum that will cover dividends on the common stock at the rate of 6 per cent, based upon the reproduction cost. The present value of the property is given as $32,746.86, while the reproduction value is placed at $55,529.31.

The application of the Bucyrus Light & Power Company for a rehearing of its case has been denied by the commission. In all probability it will be taken to the Supreme Court.

New York Commissions

On account of the illness of Mr. Daniel V. Murphy, special counsel for the Second District commission in the New York Telephone Company rate case, the date for beginning presentation of testimony by the company has been postponed from Sept. 22 to Sept. 30 in New York City.

The Second District commission has decided that telephone companies cannot be compelled to furnish service to patrons who use telephone equipment other than that supplied by the company. The decision in this case arises from the complaint of the State Agricultural and Industrial School at Industry, N. Y. This complaint asked that the New York Telephone Company be compelled to furnish connections with the private switchboard erected and maintained within the institution. Commissioner Frank Irvine holds that the public necessity represented by efficient telephone service takes precedence over the private convenience even of a public institution which might demand the service asked in the complaint.

Pennsylvania Commission

The Pennsylvania Public Service Commission has rendered a decision in the case of Mr. James Thompson and M. A. Hanna & Company against the Erie County Electric Company, holding that a company may classify its customers without regard to costs or methods of production. The complainants charged that the rates they were asked to pay for electrical energy were greater than those made against other persons and corporations for similar service. The commission said: "It has long been recognized in the manufacture of electricity that irregularity in the demands of a customer results in the least desirable class of business, owing to the necessity for making provision for furnishing sufficient service at the time of greatest requirements for the same, and then having a greater or less portion of the power-station equipment idle at other times, when the customer has no need of the full amount that provision has been made for. Another difficult service to maintain is where the requirements are subject to sudden and recurring wide fluctuations. In such cases unusual precautions and provisions are required at the generating station, to prevent the variable demands of one customer, unless served from an individual generator, affecting adversely the regularity of the voltage and energy furnished to all the other customers."

Current News Notes

Electric Crossing Gates at Vancouver.—Seven electrically operated crossing gates are being installed by the Canadian Pacific Railroad to protect traffic across its tracks along the water front at Vancouver, B. C. They are of the portcullis type and will be raised and lowered by pressing a push-button controlling the master operating switch.

* * *

A One-to-Five Customer-Population Ratio at Dallas, Tex.—With a population of 110,000 served by its lines, the Dallas (Tex.) Electric Light & Power Company has 20,000 customers connected, representing one user of electric service for every five and one-half inhabitants, or, taking the usual basis of the directory makers, which assumes five persons for each family, almost every household in Dallas is a user of central-station service.

* * *

Demand for Electric Trucks in England as Result of War.—Because of the fact that gasoline trucks are useful for service in the European war zone, and since nearly all such trucks in England have been requisitioned by the government, electric vehicles are now in many cases being substituted. It is reported that the available stock kept on hand by the various dealers in London has been entirely bought up. Recently American manufacturers inaugurated a campaign to sell electric automobiles in England, and present conditions seem exceedingly favorable to the success of their efforts.

* * *

SOCIETY MEETINGS

Rejuvenation at Dayton.—The Dayton branch of the Jovian Order held a highly successful rejuvenation on Tuesday evening, Sept. 15, initiating a class of thirteen candidates. One hundred members and guests were present, and Statesman T. F. Kelly presided. The initiatory work was handled by the following team: Jupiter, Mr. T. F. Kelly; Pluto, Mr. A. Gibbons; Vulcan, Mr. H. F. Wollaston; Neptune, Mr. S. Perry; Mars, Mr. K. Nocka; Mercury, Mr. C. A. Kuebler; Apollo, Mr. C. F. McClure; Avrenium, Mr. G. B. Sarye; Hercules, Mr. F. S. Breidenbach; Chief Imp, Mr. O. B. Remelin; Imps, Messrs. James Atwood, R. R. Pleasant, and H. Long. The initiates included Messrs. G. R. Hughes, T. L. Farnham, O. Kressler, E. C. Wells, J. J. Munsell, R. W. Martin, R. D. Gillespie, N. Emmons, I. G. Kumler, E. P. Tappehorn, T. J. Parent, W. A. Keyes and George Grove.

* * *

Activities of Inventors' League.—Upon a special invitation of the New York Telephone Company given to the members of the Inventors' League of the United States, the latter, after a short business meeting held on Sept. 14, visited the telephone exchange in West Seventeenth Street, New York, where the interesting features of this exchange were fully explained. The members of the league have also been invited by the New York Edison Company to visit and inspect one of its power stations on Monday evening, Oct. 5. Prior to that visit a meeting of the league will be called at the league's rooms in Scheffel Hall, 194 Third Avenue, New York, at 7:30 p. m. An invitation to attend this meeting is extended to inventors in general. The league will have two booths at the International Exposion of Inventions, to be held at the Grand Central Palace, New York, from Dec. 12 to 19, where medals and diplomas of the American Institute will be awarded.

Central Station in Office-Building Basement

Auxiliary generating and steam-heating plant of the Northwestern Electric Company in Portland, Ore., connected with hydroelectric plant on White Salmon River

THE Northwestern Electric Company brings electricity into Portland, Ore., from its hydroelectric plant on the White Salmon River in Washington, described in the *Electrical World* Aug. 9, 1913. Transmission is at 66,000 volts over a cedar-pole line of standard construction. The only point of special interest in the transmission line is the crossing at the Columbia River. This consists, in fact, of two separate crossings, one having two supporting towers 125 ft. high and two strain towers 40 ft. high, the other having three supporting towers 150 ft. high and two strain towers 40 ft. high. The towers are arranged for six transmission wires and one ground wire. The transmission wires are of ¾-in. crucible-steel cable, carried on grooved wheels on the supporting towers and held by three sets of strain insulators at the strain towers.

The transmission line is carried well into the city to a main step-down and distributing station on the east bank of the Willamette River. This station is a concrete, fireproof structure, with remote-control solenoid-operated switches, following general standard design. The potential is transformed to 11,000 volts for distribution to distant points, and across the river by submarine cables to the West Side. A portion of the energy is also again reduced in pressure to 2400 volts for local distribution within reach of the main station.

After crossing the river to the West Side of the city the circuits lead to a combined steam-heating and generating, step-down alternating-current distributing and direct-current generating and distributing plant in the basement of the Pittock Block, which stands in the heart of Portland's business district. This plant, one of the largest of its kind in the West, is installed entirely below the street surface, in the basement of a large office building. It contains 3000 normal hp in Stirling boilers, capable of being overloaded 100 per cent and using oil fuel; two 3500-kw Curtis steam turbines, two 1500-kw motor-generator sets, with provision for two more; two balancer sets; two exciter units, one steam-driven and one electrically driven, and the necessary transformers, switchboards and other apparatus.

Elimination of Vibration and Noise

In the design of the station particular attention had to be given to vibration, noise and heat, in order to avoid annoyance to the tenants of the building. Forced ventilation was, of course, necessary.

To eliminate any possible vibration, the moving machinery was placed on extra-heavy concrete founda-

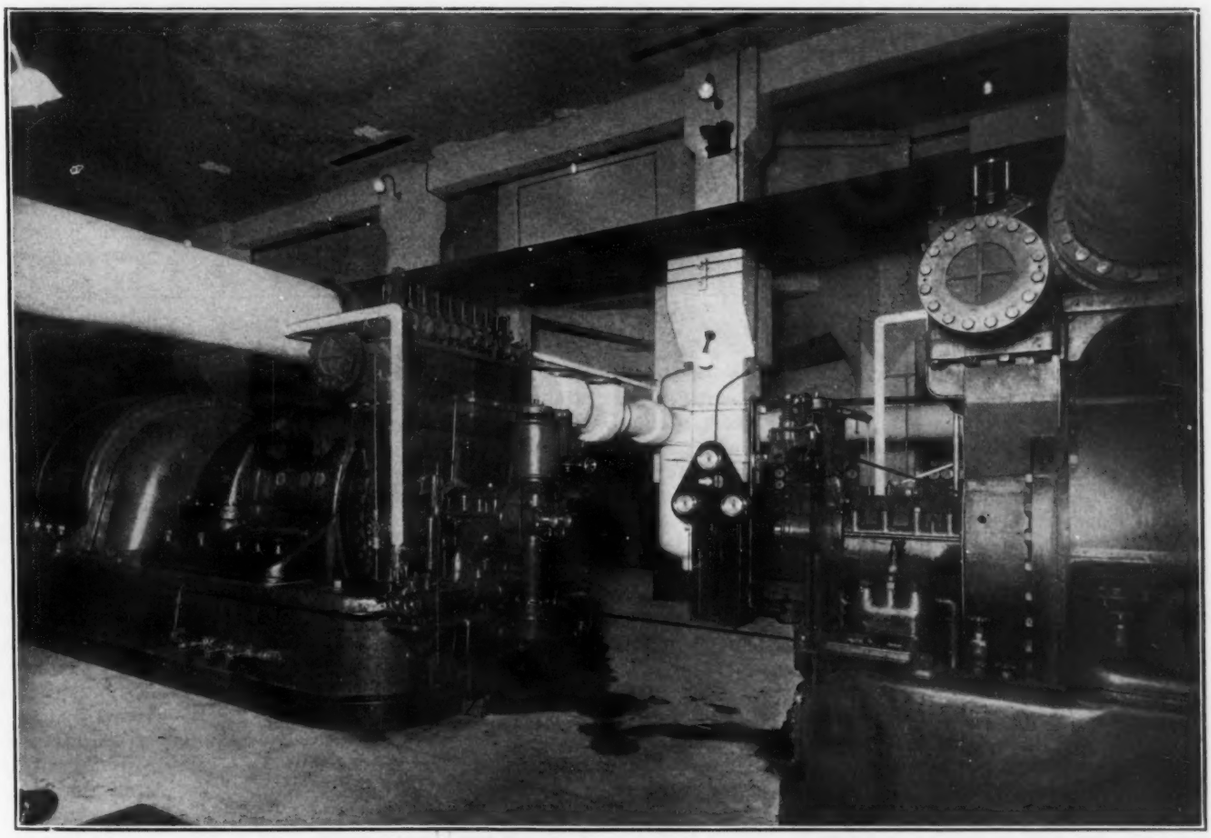


FIG. 1—GENERATOR ROOM OF NORTHWESTERN ELECTRIC COMPANY IN PITTOCK BLOCK, PORTLAND, ORE.

tions, separated from the building foundations by an 18-in. space, which space was filled with sharp crushed rock. This space was narrowed to 3 in. at the floor line and covered with an iron floor plate. Special care was also taken in the balancing of the machines, and the axis of rotation of the large turbines was placed at right angles to that of the exciter turbine and motor-generator sets, so that any vibrations would be broken up and not amplified in any way.

Noise was eliminated in every way possible. The synchronous motors driving the direct-current generators are entirely inclosed, air for cooling them being supplied by small motor-driven fans which receive their supply of air from a shaft to the roof, and the heated air

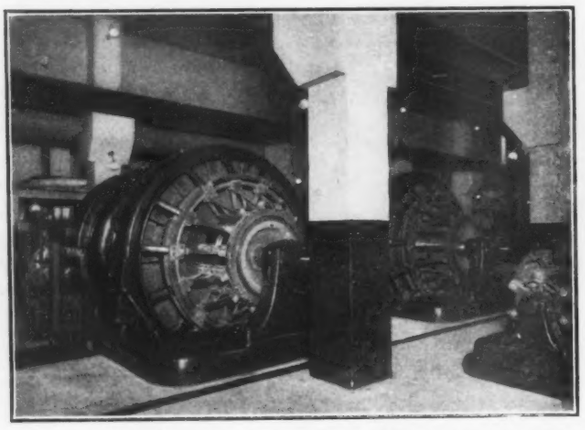


FIG. 2—MOTOR-GENERATOR SETS IN PITTOCK BLOCK

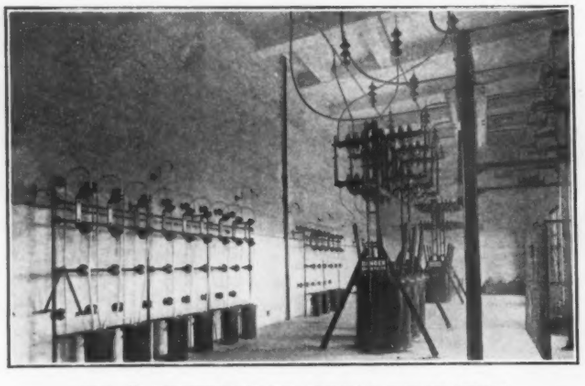


FIG. 3—INTERIOR OF ALBINA SUBSTATION

is discharged through ducts under the floor leading to a main discharge shaft surrounding the smokestack. The steam turbines draw their own air from a separate shaft and discharge it into the main discharge shaft. A triple ceiling prevents any remaining noise from reaching the floor above.

Heat and ventilation are cared for jointly. A large airshaft from the roof supplies air to two large steam-driven fans, which force the air through a passage over, and the entire width of, the ceiling, discharging it through openings properly placed and proportioned for supplying proper ventilation. The same shaft supplies air for the boilers. The arrangement prevents any heat from the plant passing through the ceiling to the rooms above.

After several months of operation the plant has proved entirely satisfactory, some slight changes in the ventilating openings being all that have been found necessary. The steam turbines are operated non-condensing, the exhaust steam going to the steam-heating mains at about 6 lb. pressure.

Under normal conditions of operating, electricity is supplied from the hydroelectric plant, with the steam turbines either floating on the line or generating at a point which will just supply the needed steam to the heating mains. Tirrill regulators are used at the main power plant, on the turbine generators and the synchronous motors, resulting in practically perfect voltage regulation. If the circuits from the hydroelectric plant fail, the steam plant picks up the load with no interruption.

Electricity is distributed from the Pittock station for the entire underground district at 120/240 volts direct current, and at 2400 volts and 11,000 volts alternating current for the overhead district. The steam-heating

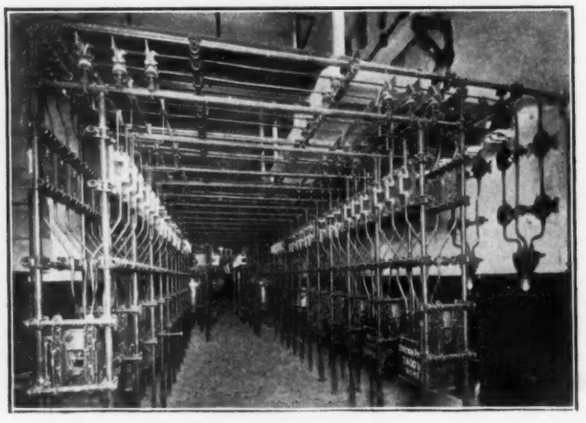


FIG. 4—BUS STRUCTURE IN PITTOCK BLOCK

FIG. 5—CIRCUITS ENTERING ALBINA SUBSTATION

distribution is at low pressure. The system was installed by the American District Heating Company. Mr. B. C. Condit is chief engineer of the company under whose supervision the installation has been made.

Mineral Reserves and Their Relation to Industrial Independence

Mr. George Otis Smith, director of the United States Geological Survey, has prepared a paper on "Our Mineral Reserves." The paper has been published in pamphlet form. The sub-title of the paper, "How to Make America Industrially Independent," indicates the purpose of the discussion. Mr. Smith is convinced that now is America's opportunity to make its mineral industry even more dominant as a factor in the world commerce, and his paper was prepared as an answer to inquiries received by the Geological Survey, and also to stimulate other requests for co-operation in this important work.

Transatlantic Radio Station at Sayville, N. Y.

Equipment of Long Island station through which German war news is received — Possibility of direct wireless communication between Germany and the United States. By John L. Hogan, Jr.

THE Sayville radiotelegraph station, on the south shore of Long Island about 60 miles from New York, has been the center of much interest and discussion in the past few weeks, since after the cutting of the German cable at a point near the Azores nearly all European war news from Germany has been received at this wireless plant. The American public has been treated to allegations of "fake" transmission and counter claims as to the genuineness of the dispatches furnished for publication, and the daily press has become involved in a quite heated argument as to the possibility of Sayville's receiving direct from Germany. It is therefore worth while to consider the technical side of the matter and to examine the installation in question.

About two years ago the Atlantic Communication Company finished erection of the Sayville plant, and it was announced at that time that direct transatlantic telegraph service with Nauen, near Berlin, would ultimately be furnished through this station. The aerial system, and in fact the entire equipment,[1] is on so large a scale as to indicate that this was the purpose. The antenna consists of a twelve-wire umbrella radiating some 400 ft. from the top of a 500-ft. triangular-section guyed steel tower and having its wires tied at their outer ends by 800-ft. guys to a ring of short poles. The tower itself is in two sections, the lower of which rests upon an insulated ball-and-socket joint at the base and carries at its top (about 360 ft. from ground) another universal joint which supports the upper section. Thus the tower depends entirely upon its twelve guys and has only vertical rigidity. The guy wires are arranged in four groups of three each, fastened to the tower at four heights and in pairs to anchorages set in two concentric circles about the tower. The antenna is insulated from the tower, and the guys and tie wires are sectionalized by special glass and porcelain strain insulators.

No direct earth connection is used in transmission, but instead there is utilized a "capacity ground" or electrical counterpoise, which consists of an elaborate system of radial wires extending under and beyond the umbrella aerial and strung on insulators over lines of 15-ft. poles.

The station was originally fitted with two complete transmitters, one of 50-kw and the other of about 8-kw primary alternating-current power. It is stated that a third transmitter, of still smaller power, has since been installed for short-distance working with ships. Energy at 440 volts, sixty cycles, three-phase, is brought to the station from public service lines and operates a General Electric motor-generator for charging a 600-amp-hr., 220-volt storage battery. This accumulator furnishes energy for operating the entire radio plant.

The sending sets are of the high-spark-frequency, quenching-gap type and are much alike except as to size. In the high-power transmitter the 220-volt direct current operates a 75-hp motor directly connected to a 60-kva, 500-cycle, 600-volt, single-phase alternator. Power from this machine passes through control switches and the signaling relay to the power transformer, which has a secondary voltage of 60,000. This high pressure is used to charge the oscillation circuit condenser, which consists of five groups of tinfoil and glass Leyden jars in series-parallel and has a total capacity of 0.044 microfarad. The condensers discharge across a bank of eight quenching-gap units, in which from forty to fifty short, highly cooled parallel plate gaps are placed in series, and through the primary of the oscillation transformer. Conductively coupled to this coil is the aerial-to-ground circuit, in which high-frequency current of about 120 amp is set up. The antenna resistance is given as something under 3 ohms at 3000 m wave-length, so that the antenna power is about 35 kw and the over-all efficiency from the power transformer primary about 75 per cent to 80 per cent.

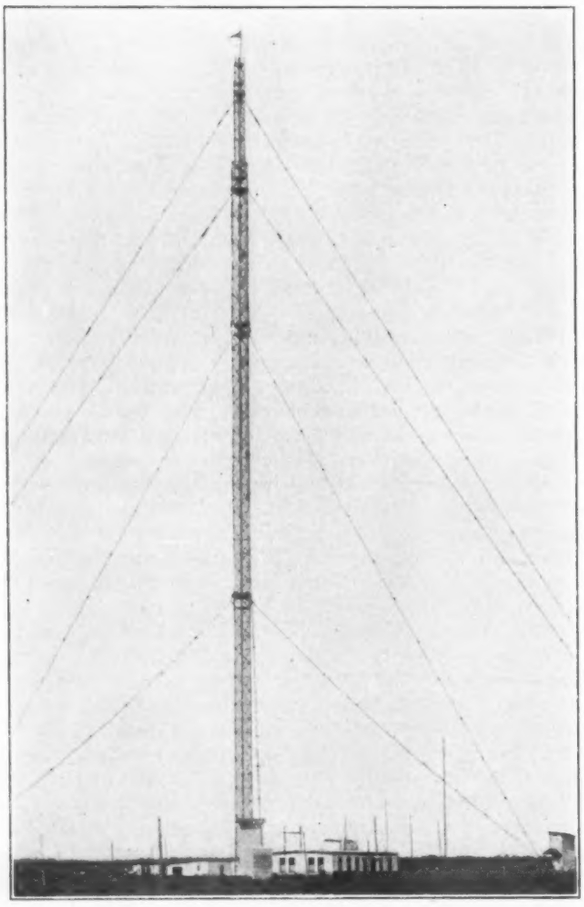
The entire transmitter is designed for remote control, and the labor of operating is divided between the telegrapher, in his soundproof operating and receiving room, and a supervising engineer, who remains in the control room separated from the sending apparatus by only a glass partition. The operator telegraphs either by hand key or punched-tape apparatus through a series of three relays, the last of which breaks the main primary current of the power transformer and has forced air cooling in order to handle some 150 amp to 200 amp. A motor-driven antenna switch, which shifts the aerial from sending to receiving connections and protects the operator by opening the relay circuit when in receiving position, is also controlled from the operating room, by means of a foot switch. The adjustments of transformer voltage, generator speed, spark tone, oscillation circuit coupling, etc., are maintained by the operating engineer in the control room, where are installed the necessary meters, signal lamps, switches and rheostats. There is also provided a tone indicator, in the form of a small vacuum tube inductively affected by the sending current and rotated by a motor. Observation of the flashes of this tube gives the operating engineer direct information as to the regularity and purity of the high-pitched musical spark which it is his duty to maintain.

With this high-power transmitter a number of distance tests to ships and other powerful land stations have been made. Press messages sent out nightly have been received under best conditions by ships in the English Channel and at Gibraltar over distances approximating 3200 miles. Transmission to the German plant at Nauen has been accomplished both by day and by night, it is stated; but the fact that commercial telegraph service has not been opened to the public bears out the opinion that daylight working between these stations cannot be relied upon in times of heavy "static" disturbance. These atmospheric interferences have been the bane of all long-distance radiotelegraphing, and it is not surprising that the 50-kw plant at Sayville cannot be depended upon for reliable communication with Nauen, some 3700 miles or more away.

But receiving from Germany is quite a different matter. The Nauen station has its aerial wire system sup-

[1]Described by Messrs. F. van der Woude and A. E. Seelig in a paper before the Institute of Radio Engineers, 1913.

ported by a guyed tower similar to that at Sayville but nearly 1000 ft. in height, and the sending equipment there is stated to include both high-frequency spark and radio-frequency (continuous-wave) generators, each capable of supplying 100 kw of oscillation power to the antenna. Basing the conclusion upon the performance of comparable equipments over like distances, it would appear that even though Sayville were fitted only with the usual receiving apparatus comprising sensitive rectifying detectors and closely adjustable tuning apparatus, good signals would be heard from the Nauen spark transmitter at night whenever atmospheric disturbances were no more than moderate. There would, therefore, seem no reason to believe that the Nauen-Sayville transmission is impossible upon technical



RADIOTELEGRAPHIC STATION AT SAYVILLE, L. I.

grounds, and it is indeed probable that for at least three or four hours each night fairly good transmission is had.

The statements that no press dispatches are transmitted from Nauen, and that consequently none are received at Sayville, are said to be based upon the fact that certain stations along the eastern coast of the United States, which are normally able to receive from the powerful Nauen spark transmitter, have been unable to intercept any such messages. Ergo, it is said, Sayville has been unable to receive any messages of the kind. Accepting the statement as made, there would appear no disproof of the transmissions alleged, for at least two reasons.

The first of these two possible explanations is the almost obvious one that by the use of special gas amplifiers for building up currents in the telephone circuits Sayville might receive from Nauen during almost static-free night periods, when the transmitter there is operated on powers so small as to give unreadable signals at any of the United States stations which are quoted as having been on the watch to intercept such communication. These telephone relays are used exclusively by the Telefunken companies and appear to surpass in delicacy the similar devices generally available in this country. The second reason is that transmission may have been upon sustained waves, which are not audible to receivers equipped with the usual apparatus. By the use of oscillating vacuum tubes operating upon the heterodyne principle, and so producing "beat" signals which may be further amplified by the relays mentioned, it would be possible for Sayville to interpret signals utterly too feeble to affect the tikker receivers which are commonly relied upon for translation of messages carried by continuous waves.

The writer holds no brief for the validity of the dispatches published in the daily press of the country as originating at Nauen and received by Sayville. The propensities of space writers to exaggerate, especially upon such topics as the European conflict, are too widely appreciated to permit justification of any such position. There is, however, great interest shown by engineers in general as to the possibility of direct radio transmission from Germany to the United States, and it is the purpose of this brief discussion to point out that such communication is easily possible under favorable conditions, such as occur almost nightly, in the present state of radio technology. To refute entirely the claims that the questioned messages were actually transmitted and received it will be necessary to demonstrate that the Nauen station has been observed far more closely than would appear from any statements made public to date.

Combined Electric and Hydraulic Drive for Air Compressor

A 300-hp air compressor recently installed on one of the properties of the Snowstorm Mining Company in the Cœur d'Alene district of Idaho is connected by rope drive to a twin-runner waterwheel unit and to a 250-hp induction motor. The shafts of these two driving units are coupled together so that the units may be used independently or in parallel. Energy for the motor is obtained from a commercial plant.

A 46-in. rope sheave is mounted on the motor shaft and is connected to a 14-ft. sheave on the compressor. The waterwheel equipment consists of two runners. One runner is approximately 44 in. in diameter and is capable of developing 325 hp when running at a speed of 347 r.p.m. This speed is the same as the full-load speed of the motor. The other wheel is approximately 72 in. in diameter and develops 250 hp at 212 r.p.m. Both waterwheels are keyed on the same shaft, which is extended and coupled to the motor shaft, carrying the driving sheave. Both wheels are never operated at the same time. The water supply to the idle wheel being cut off, it rotates on the shaft without performing useful work except to provide additional flywheel effect for the installation.

In case the compressor is operating at full load and sufficient water is available, the 44-in. runner alone is operated; if, however, the water supply is not great enough, energy is taken from the commercial plant's circuit to drive the motor and thus assist the waterwheel. At certain times, when the output of the compressor is low, the 72-in. runner is used.

The hydraulic apparatus for this installation was designed and constructed in the San Francisco works of the Pelton Water Wheel Company.

High-Voltage Outdoor Switching Stations

Use of the horn-gap air-break switch as exemplified on the transmission system of the Mahoning & Shenango Railway & Light Company of Youngstown, Ohio. By W. H. Acker and C. A. Harrington

IN the natural growth and extension of a high-tension transmission system need for sectionalizing equipment on the main arteries to facilitate the segregation and cutting out of portions of the lines which may develop trouble is soon manifest. The construction of tap-off or branch lines from the main cir-

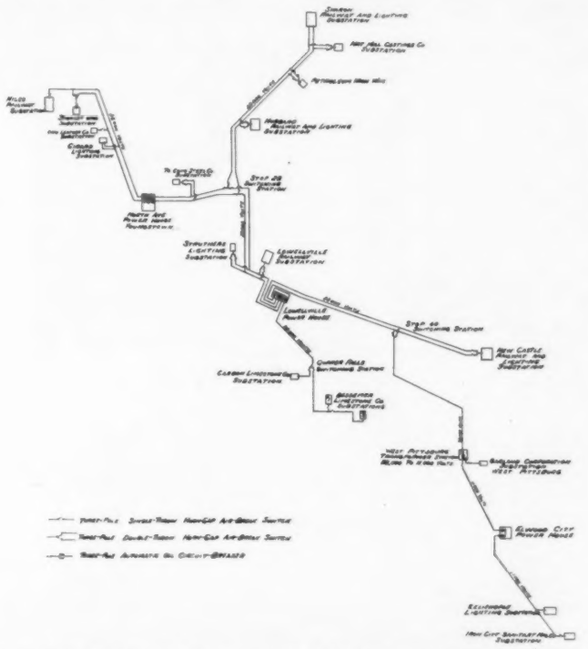


FIG. 1—HIGH-VOLTAGE TRANSMISSION SYSTEM OF MAHONING & SHENANGO RAILWAY & LIGHT COMPANY

cuits further increases the necessity for suitable disconnecting arrangements, such circuits being of relatively minor importance as compared with the main lines. The connections entering substations either tapping off the main transmission circuits or served from these tap-off or branch lines must in many cases be provided with outdoor disconnecting and switching or selector equipment in order that the substation may be disconnected and isolated from the system in case of serious trouble or fire in the latter, and that the service connections through the substation may be readily transferred by means of outdoor selector switches from one high-voltage circuit to another, where double-circuit transmission is used, without the service being interrupted.

It is always, of course, extremely desirable, and in many cases absolutely necessary, that the outdoor disconnecting, switching and selector arrangements be dependable, simple and inexpensive. In many cases they are infrequently used, but when needed must be operated quickly and positively, while at the same time the connected load which may receive energy through the switch is very small and the revenue derived therefrom would not warrant an expensive arrangement.

It is only within the last few years that the horn-gap air-break switch has come into prominent use for outdoor switching and sectionalizing of high-tension transmission lines, being utilized under just such conditions as are outlined above.

On the transmission system of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, there are eighteen such outdoor air-break switching stations and a total of thirty-two three-pole single-throw and one three-pole double-throw horn-gap air-break switches.

Fig. 1 is a "one-line" diagram of this transmission system showing the locations of the outdoor air-break and indoor oil switches. Under normal operating conditions the generating stations at Youngstown, Lowellville and Ellwood City operate in parallel through the transmission system, the main portion of which is a double circuit. Automatic oil circuit-breakers are provided on all high-tension feeders leaving the various generating stations, and all synchronizing of stations into the system is done across these oil circuit-breakers. All outdoor switching is taken care of with the horn-gap air-break switches.

The air-break switching stations consist of a suitable timber framing, on which the switches are mounted, and an operating platform from 10 ft. to 12 ft. below the switch framing, from which the switches are oper-

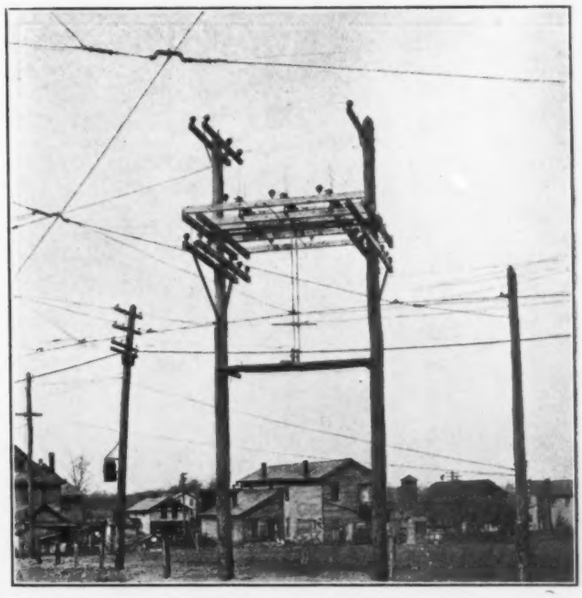


FIG. 2—INSTALLATION TO CONNECT SUBSTATION TO EITHER OF TWO TRANSMISSION LINES

ated. In most cases the switching station is supported from ordinary wooden poles. The arrangement of the switches, wiring and operating handles varies considerably and depends entirely upon the operating conditions, all switching stations being duplicates where the same conditions have to be cared for. All handles for operating the air-break switches are of wood, the

grounded galvanized-iron-pipe operating mechanisms previously used having been replaced in order to eliminate the grounding of the metallic frame of the switch. In some cases the wooden operating handles are so arranged that they interlock the two air switches on the platform in such a manner that both switches cannot

FIG. 3—TURNOVER SWITCH ARRANGEMENT FOR SUBSTATION

be in the closed position at the same time, making it impossible for the two transmission circuits to be paralleled at stations thus equipped. At other switching stations where it may be desirable to parallel the two high-voltage circuits while transferring the load from

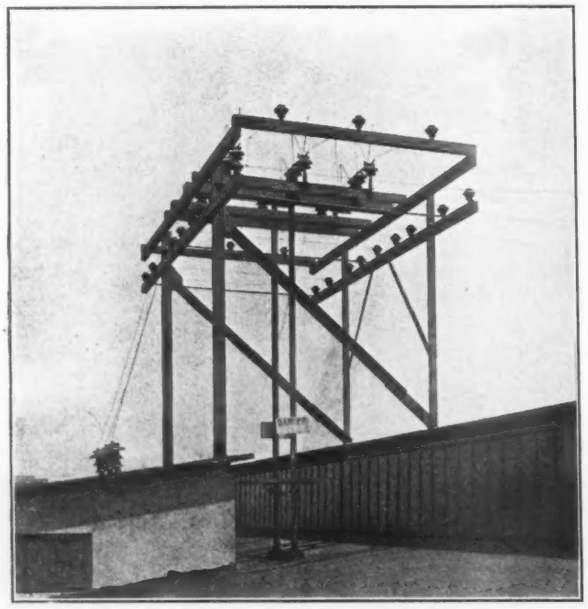


FIG. 4—HORN-GAP SWITCHES CONTROLLING ENTRANCE OF HIGH-VOLTAGE LINE TO FACTORY BUILDING

one circuit to the other the interlocking of the operating handles has been omitted.

The accompanying halftones of several different switching towers designed to meet various and very different operating conditions show how readily the horn-gap air-break switch can be adapted and arranged to take care of disconnecting, sectionalizing and selector switching problems.

Fig. 2 shows a switching tower on which two switches are mounted. The double-circuit transmission lines come onto the tower just below the framing on which the switches are mounted and the single circuit into the substation leaves the tower on top. The galvanized-iron operating rods have since been changed to wood. The handles operating these switches are not interlocked and the station attendant may parallel the transmission circuits upon receipt of the necessary orders. In case of interruption of energy supply the switch which is closed may be opened and the other switch may be closed and the service resumed without waiting for orders.

The switching tower shown in Fig. 3 was built to take care of the same conditions as that in Fig. 2, with the exception that it was necessary to bring the two high-voltage transmission circuits in on the top and run the single circuit into the substation from below

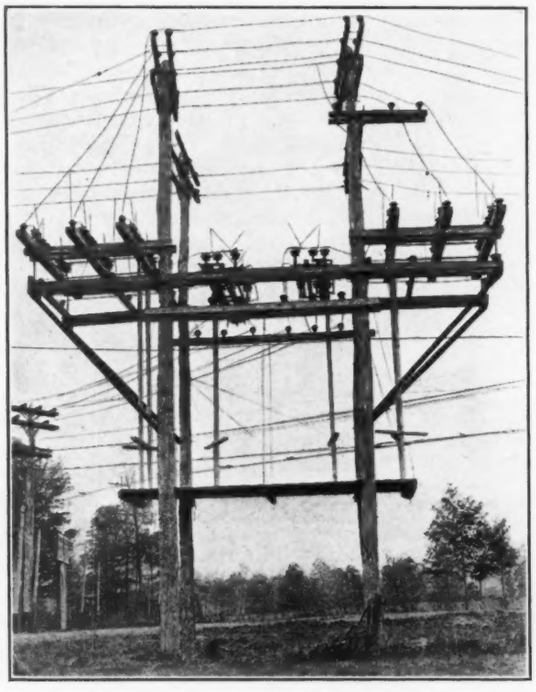


FIG. 5—INSTALLATION OF SIX HORN-GAP SWITCHES AT JUNCTION OF SIX TRANSMISSION LINES

the framing for the switches. A large number of the switching towers are duplicates of Fig. 3.

The switching station shown in Fig. 4 is mounted on top of a steel-frame factory building, the substation apparatus being installed below on the gallery floors. Two three-pole single-throw air-break switches are mounted on the wooden framing on top. The two transmission circuits come onto the structure below the switches and on the outside. The single circuit from the switches to the roof bushings leaves the structure below the switches and is mounted between the two transmission circuits. The wooden operating rods for the switches are interlocked by the horizontal operating handles.

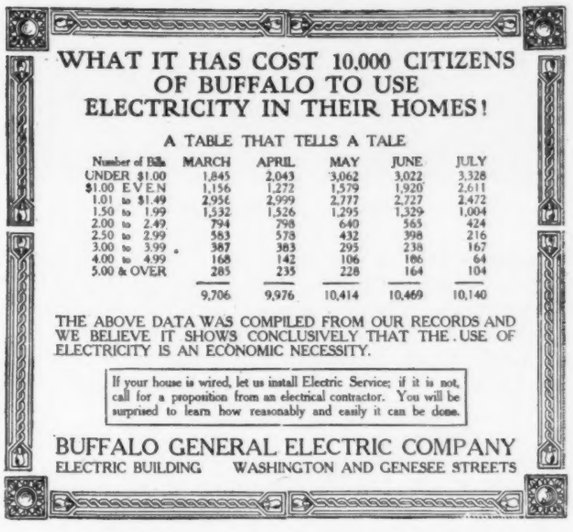
The view shown in Fig. 5 is of a sectionalizing switching tower at the junction of six three-phase transmission circuits. Use is made of six three-pole single-throw air-break switches so arranged that any circuit leaving the tower may be cut out independently of the other circuits. No arrangement for paralleling the circuits is provided, the duplicate transmission lines being independently sectionalized on opposite ends of the tower.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

The Users of Electricity in Buffalo

A table which classifies about 10,000 of the residence consumers of electricity in Buffalo, N. Y., according to their monthly bills has been used by the Buffalo General Electric Company in newspaper advertisements such as that reproduced to show the public that electricity is an



WHAT IT HAS COST 10,000 CITIZENS OF BUFFALO TO USE ELECTRICITY IN THEIR HOMES!

A TABLE THAT TELLS A TALE

Number of Bills	MARCH	APRIL	MAY	JUNE	JULY
UNDER $1.00	1,845	2,043	3,062	3,022	3,328
$1.00 EVEN	1,156	1,272	1,579	1,920	2,611
1.01 to $1.49	2,956	2,999	2,777	2,727	2,472
1.50 to 1.99	1,532	1,526	1,295	1,329	1,004
2.00 to 2.49	794	798	640	565	424
2.50 to 2.99	583	578	432	398	216
3.00 to 3.99	387	383	295	238	167
4.00 to 4.99	168	142	106	186	64
5.00 & OVER	285	235	228	164	104
	9,706	9,976	10,414	10,469	10,140

THE ABOVE DATA WAS COMPILED FROM OUR RECORDS AND WE BELIEVE IT SHOWS CONCLUSIVELY THAT THE USE OF ELECTRICITY IS AN ECONOMIC NECESSITY.

If your house is wired, let us install Electric Service; if it is not, call for a proposition from an electrical contractor. You will be surprised to learn how reasonably and easily it can be done.

BUFFALO GENERAL ELECTRIC COMPANY
ELECTRIC BUILDING WASHINGTON AND GENESEE STREETS

ADVERTISEMENT OF BUFFALO CENTRAL STATION

economic necessity. In addition to giving an idea of the cost of electric service, this advertisement advises persons whose houses are unwired to find out how reasonably their homes can be equipped for electric service.

From March 1 to the beginning of August the number of bills for $1.49 or less increased from 61 per cent to 82 per cent of the total. During the same period the number of bills for $1 or less increased from 31 per cent to 58 per cent of the total, while those between $1 and $1.50 decreased from 30 per cent to 24 per cent.

A New Electric Commercial-Vehicle Garage in Chicago

Electric automobile garages intended for the care of pleasure or passenger vehicles are not uncommon, but the number of garages intended for electric commercial vehicles and used for general public service rather than for the needs of private owners is very small. In Chicago a new garage has been established to serve commercial vehicles exclusively, and some features of this equipment are illustrated herewith. One complaint of the smaller users of electric wagons and trucks has been that there were few public garages where their vehicles were welcome; therefore any increase in the number of commercial-vehicle garages will be welcomed by all interested in the electric-vehicle industry.

The new establishment bears the name "Electric Service Garage" and occupies a building formerly housing the Scully Steel & Iron Company. It is situated near the corner of Halsted and Fulton Streets in the center of a district where the amount of trucking done is large. The building is illustrated in Fig. 1. The new garage is intended exclusively for electric trucks and has room for the accommodation of a large number of vehicles. It is supplied directly with direct current of a suitable voltage by the Commonwealth Edison Company, so that converting apparatus is unnecessary.

Up-to-Date Machine Shop

Operated in connection with the garage is a machine shop equipped with modern tools and intended to provide means for making any kind of repairs to electric trucks. Fig. 4 shows the repair shop. At present this machine shop is used for general outside repair work, but as the truck industry develops it is expected that the shop will be kept busy on truck repairs exclusively. It is intended that this garage and the allied repair shop shall stand in the same relation to electric wagon traffic as a railway roundhouse and repair shop does to railway traffic. Heretofore electric-vehicle garages have been used principally for charging and washing pleasure

FIG. 1—THE "ELECTRIC SERVICE GARAGE," CHICAGO

vehicles, the facilities for making repairs being comparatively limited. The service obtained from these garages meets the requirements of the owners of pleasure vehicles, but commercial vehicles call for garage service of a different kind. Electric delivery wagons and trucks cannot be operated satisfactorily

FIG. 1—1-TON TRUCK

where there are no facilities for making repairs quickly. In the new Chicago garage broken parts can be replaced on short notice by means of the 3.5-ton overhead traveling crane shown in Fig. 3. The body of the largest truck can be lifted from its chassis and replaced with very little trouble.

The wiring and construction work of this garage was all done by the men in the machine shop, who also did the work for the rather elaborate switchboard shown in Fig. 6. At the present time this board is equipped with only six charging outlets, but more charging apparatus is being installed. The charging outlets have a rating of 80 amp each and are arranged in pairs so that there are two outlets in each outlet box, as shown in Fig. 5. By means of a double-pole knife switch each pair of outlets can be operated in parallel to give "boosting" charges of 160 amp when necessary. The energy in each

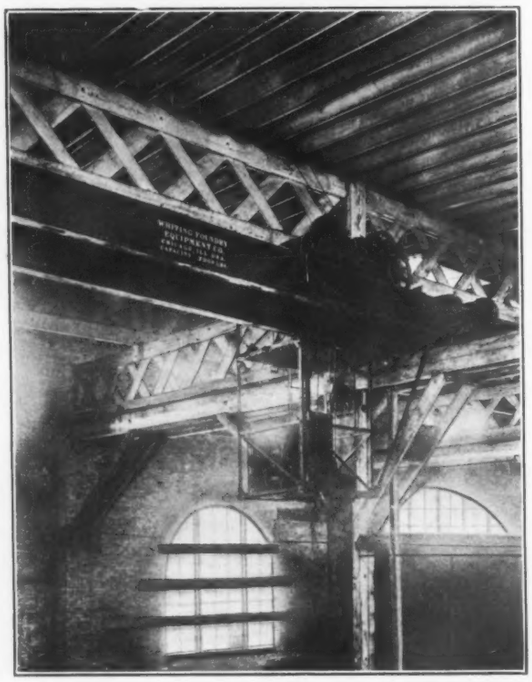


FIG. 3—3.5-TON ELECTRIC OVERHEAD TRAVELING CRANE

charging outlet passes through a kilowatt-hour meter, and all electricity is sold on a meter basis at the rate of 5 cents per kw-hr. The 1-ton electric wagon used in repair work and shown in Fig. 2 was built in the garage shop. It is of the "motor-in-the-wheel" type, the batteries being placed at the sides of the body of the truck and in such a position that they can be inspected readily.

A feature of this new electric-service garage that deserves special notice is the arrangement for keeping battery-charging records. A record sheet (supplied by the Commonwealth Edison Company for the sake of en-

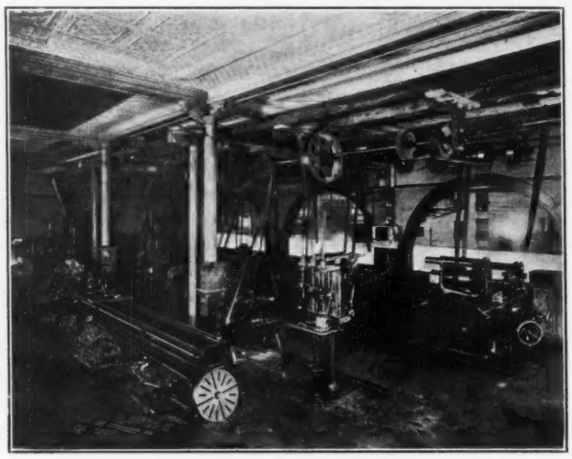


FIG. 4—REPAIR SHOP

couraging the keeping of such records) is fastened by means of thumb tacks to a thin board that slides like a drawer into a suitable cabinet. This cabinet is shown at the left in Fig. 6. A card and slide are provided for each car. When the charging of a vehicle is begun the slide is removed from the cabinet and is usually left on

FIG. 5—80-AMP CHARGING OUTLETS AND PARALLELING SWITCHES

the seat of the car until all the data relating to the charge have been entered on it, when it is put back into the cabinet. This cabinet system, first used, it is believed, by the Rochester Railway & Light Company, is a convenient and satisfactory method of keeping charging records.

Application has been made for the official garage sign

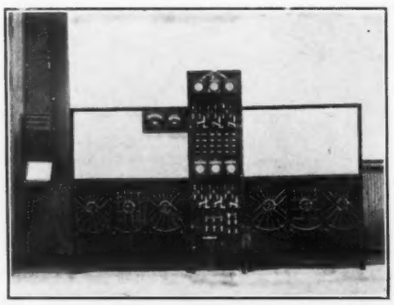


FIG. 6—SWITCHBOARD, SHOWING RECORD CABINET ON LEFT

of the Electric Vehicle Association of America. Mr. R. Macrae, electric-vehicle expert of the Commonwealth Edison Company, was consulted in relation to the designing of this interesting garage, the equipment and operating methods of which bear testimony to the growing appreciation of electric automobiles.

Rates for Street Lighting and for Cooking

In a paper read before the New England Section of the National Electric Light Association on the economics of street lighting and electric cooking rates, Mr. R. S. Hale, of the Edison Electric Illuminating Company of Boston, emphasized the distinction between comparing total income with total expenses and comparing income from one kind of service with income from another kind. Street-lighting prices have been pretty well settled in New England upon a price-per-lamp basis. Suggestions that the price ought to be per mile of street or per square yard of street illuminated are almost always made by engineers or professors who are comparing, or who expect to compare, several kinds of lamps or systems. There is seldom any desire to leave the central station free to change the system. Changes in the number of hours seldom occur during the life of a contract, and when a company is supplying only one city, and no change in the number of hours is expected, there is no need of providing for such a change. If, however, a city has any idea of changing from a moonlight-midnight to an all-night schedule, or anything between, the method used by the Boston Edison company of a fixed price per lamp plus a running charge per lamp-hour accomplishes this perfectly. The latter gives a municipality the option of changing the schedule of hours without dickering for a new price.

A fixed charge alone is seldom used for cooking rates as it allows so much waste. The use of electric ranges and heaters designed to remain in service twenty-four hours a day has been suggested, but these have not been produced commercially, and probably never will be, because even with the best designs and the best insulation the wasted heat will be far more expensive than any saving which is possible by the use of such twenty-four-hour devices. The charge for cooking must, therefore, include some price per kilowatt-hour. The charge must decrease with quantity, since it will always cost the central station less to deliver in quantities than to supply in small lots, and the user of large lots will be able to use other means of cooking and pay nothing, rather than pay the retail price. Besides the charge depending on the energy used, it is possible to have another charge depending on the maximum demand or connected load, or some other feature. Neither of these methods has met with much success in getting electric-cooking business, as a charge depending on a maximum demand is apt to keep off business which has a high demand. If such business is absolutely unprofitable—that is, brings in less income than the whole increase in expenses—it is undesirable. If, however, it brings in more income than the increase in expenses, it is better to get some profit from it rather than none.

So long as a customer has a range that he may use, so that the meter and transformer have to be big enough, the extra cost to the central station of actually using 5 kw for one hour, as compared with 1 kw for five hours, is negligible. The better diversity-factor of the short-hour customer will in such cases balance the better load-factor of the long-hour customer. In the author's opinion, the future of the cooking and heating business lies in large units that will do the work quickly and remain on only a short time. A charge depending on the kilowatts will discourage such business and be undesirable. The best form of cooking rate is a straight kilowatt-hour rate with wholesale blocks. The first block should be the same as the lighting rate, so that there will be no temptation for the customer who only wants 1 kw-hr. a month for a heating pad to ask for this rate. A minimum will prevent this, but minima are undesirable. Generally in making electric-service rates prices can be cut until the company gets to a point where any lower price will not bring in enough more business to pay for itself, and that is the lowest price to which the company can go without discrimination. Whenever a central station can make more money by discriminating between classes, and thereby reduce prices, it should be done. Discriminating between individuals will not make increased revenue if their conditions are alike. Prices for cooking and heating should be reduced until the business can be obtained, provided that the company makes a profit when it gets it. Cutting should continue until any further cut would increase expenses more than the increase in income.

In street lighting, a cut in price will bring but little more business. In Boston the cut in price of commercial and house lighting from 62.5 cents per 1000 cp-hr. to 20 cents, which is an average price to-day, has resulted in an immense increase in business. The cut in street lighting from $300 for, say, 400 cp to $103 for, say, 1100 cp has hardly increased street-lighting income at all, certainly not in proportion. The street-lighting and the ordinary business on the maximum rate are to-day least affected by competition. City councils can make a stronger effort than the scattered retail men, but it would seem that a low maximum price would do more good to the community than a low street-lighting price. If it could be brought home to the people that these balance each other and that every time a street-lighting price is forced down house-lighting reduction is postponed, it would help greatly.

Discussion

Mr. J. E. Gray, Providence, R. I., contended that the first cost of electric ranges limits their rapid growth in popular favor. On account of the investment required to supply service to electric ranges scattered about a large territory, there should be a service or minimum charge combined with a low price for energy. The service charge should be low enough to encourage the use of the smaller sizes of ranges. The Providence contract permits the consumer to discontinue the use of an electric range after six months if he desires to do so, provided that he meets the cost of removing the service installation. Mr. A. E. Hibner, Portland, Maine, urged making rates on the basis of service cost instead of by comparing different classes of service. Mr. A. J. Campbell, Waterbury, Conn., agreed with Mr. Hibner, stating that a low price for cooking is the least justified of any of his company's rates. A motor-service rate of 1.5 cents bears as large a proportion of the expense the corresponding service creates as does a 10-cent lighting rate. A cooking rate can be justified only on the basis that if it pays any profit at all it is desirable. If the efficiency of electric ranges increases, it may be possible to raise the electric cooking rate per kilowatt-hour and still compete with gas. The speaker agreed with the author that large cooking units working quickly are likely to do the bulk of the work of the future. Mr. Campbell favored reducing street-lighting rates and keeping up the general lighting rate, as the cuts in the former tend to reduce agitation. Mr. W. P. Schwabe, Thompsonville, Conn., favored a block rate for street lighting in small communities, which enables the number of lamps to be varied in a flexible manner and offers the municipality the benefit of a decreased price per lamp on extensions to the system. Dr. A. S. McAllister, editor *Electrical World*, New York, pointed out the difficulties involved in charging separate cooking and lighting rates to the same customer, from the standpoint of explaining to the customer the reasons for the discrimination. He stated that the author presented a most logical argument for discrimination in rates but ignored the ammunition supplied thereby to agitators who may use it to the disadvantage of the industry.

Illumination and Wiring

Exterior Illumination of Ohio Capitol to Be Permanent

The electrical equipment which was employed to illuminate the exterior of the Capitol at Columbus, Ohio, during the recent State fair will be left as a permanent installation so that the building may be illuminated every night hereafter, thereby adding to the attractiveness of the central part of the city. High-power lamps outline the projecting cornice and the series of windows contained in the dome. The flagstaff is tipped with a 1000-cp nitrogen-filled unit, while the flag itself is illuminated by concealed lamps so that it can be seen from afar even at night. Energy for lighting the lamps will be supplied by the State from its state prison generating station.

The Illumination of Coal Mines

By R. P. Burrows

The application of the principles of industrial illumination in the lighting of a coal mine must be made in the face of conditions unusual and difficult to overcome. In fact, all of the conditions looked upon with disfavor by the illuminating engineer are rampant—low black ceilings, black walls, dust, smoke, and dampness—but in spite of these very satisfactory results have been obtained.

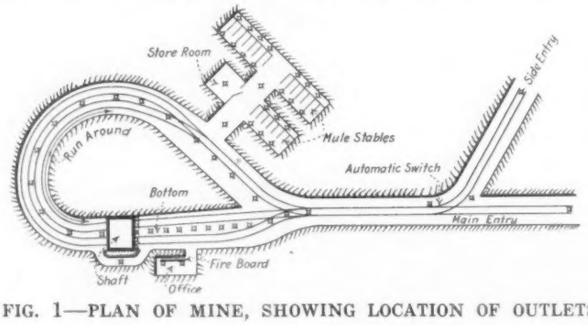


FIG. 1—PLAN OF MINE, SHOWING LOCATION OF OUTLETS

An ordinary mine can be considered as composed of six parts, the bottom, the run-around, main entry, side entries, the mule stables, and offices, all of which are shown diagrammatically in Fig. 1. The lighting requirements of each of these divisions are distinct and will, therefore, be discussed separately. Since it is the means of entrance and exit for both men and coal, and accommodates more traffic than any other part of the mine, the bottom should receive the most attention of the lighting expert from the standpoint of both safety and convenience. In the main entry, through which all the cars must pass, the function of the lamps is not so much to furnish illumination as to silhouette objects which may obstruct the passageway. The side-entry ways, which are simply spurs extending out from the main entry, are lighted only where there is an exceptional amount of traffic, and even then only silhouette lighting need be employed. It is in this part of the mine that the actual work of coal mining is performed. The miners' cap lamp furnishes the necessary illumination for this work. The junction of the side entry and the main entry should receive special attention, for at this point there are switches and dangerous cross-over trolley wires to be brought into prominence. The run-around requires only sufficient light to make visible obstructions in the path of the empties as they leave the cages.

Fig. 2 shows a portion of a well-illuminated bottom and shaft opening of a typical mine, the view being from the bottom through the shaft into the run-around. The lighting of the shaft in this case was accomplished by employment of 40-watt tungsten-filament lamps equipped with angle reflectors placed above and across

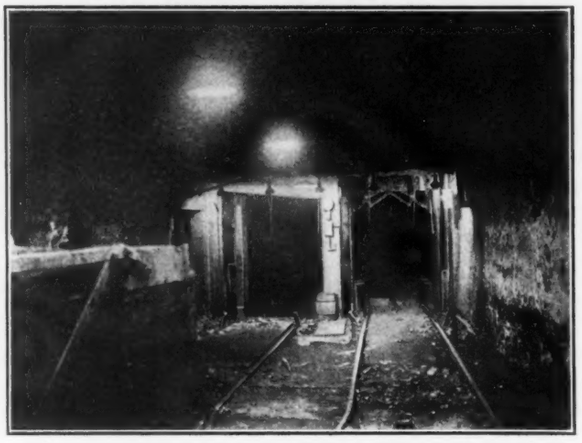


FIG. 2—ILLUMINATION OF MINE WITH TUNGSTEN-FILAMENT LAMPS AND REFLECTORS

the shaft opening so as to direct the light on the cages, signal whistle, and beyond into the run-around. The maximum intensity is at the near edge of the cage, and the eyes of the workmen on this side of the shaft are not subjected to the glare of the lamps. Fig. 3 shows this same portion of the mine lighted by means of bare carbon lamps. It will be readily seen that these lamps do not distribute the light where it is needed, and in addition the glare of the bare lamps obscures that portion of the mine which lies beyond them.

The method of lighting that portion of the bottom where the "spragging" or braking and switching of the cars is done is shown in Figs. 2 and 4. Forty-watt lamps with shallow dome reflectors are placed above and between the two tracks. These units are spaced at 7-ft. intervals and are about 7 ft. above the floor. It

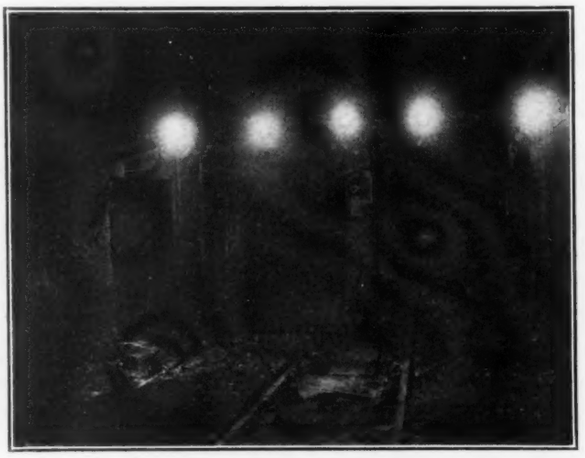


FIG. 3—ILLUMINATION OF MINE WITH BARE CARBON LAMPS

will be noted from Fig. 4 that the car wheels are well illuminated and that there is practically no glare. The lighting of this part of a mine should ordinarily be designed on the basis of from 4 to 5 ft.-candles at the floor, not so much because the nature of the work demands this intensity, but because of the greater safety

which results from ample illumination, and because the dust collects on the reflectors and lamps to such an extent as to decrease greatly the amount of light delivered. Another reason for using a high intensity as the basis of design is that in most mines the voltage fluctuates through wide ranges and the voltage drop is frequently of such magnitude as to cause excessive dimming of the lamps.

The run-around, which is shown in Figs. 2 and 4 beyond the shaft, is illuminated with 25-watt lamps equipped with shallow dome reflectors, spaced 15 ft. apart and 7 ft. from the floor.

The main entry is lighted with shallow-dome reflectors and 25-watt lamps spaced at intervals of about 300 ft., the height depending upon the height of the entry.

FIG. 4—ILLUMINATION OF CARS AND TRACKS

When the spacing falls near a side entry, use is made of two units, one to illuminate the switch and the junction, while the other illuminates a portion of both the main and the side entries and thereby tends to eliminate collisions.

The mule stables, being little more than caves with low roofs, are illuminated by means of 40-watt lamps equipped with angle reflectors placed against the back wall and as high as possible, one unit to each two stalls. In front of the stalls, opposite the angle units, 25-watt lamps with deep bowl reflectors are used to illuminate the feed boxes and the passageway.

The mine offices are small rooms usually containing a telephone. One 25-watt lamp equipped with a shallow dome reflector will furnish ample illumination for the interior, but some means should be employed for lighting the entrance, either an angle or a shallow dome reflector with a 25-watt lamp, so that it can be easily located in case of fire or accident. The fire-board in the office at the foot of the shaft should be well illuminated with one or two 25-watt lamps equipped with angle reflectors, the number depending upon the size of the board.

Frequent whitewashing of the walls of the bottom, offices, mule stables and run-around, and the walls for 20 ft. on each side of a unit in the entries, will greatly increase the illumination in these parts of the mine.

In order to obtain sufficient and properly directed light where the use of wall and ceiling reflection cannot be relied upon, to keep the load on the generator as low as possible, and to maintain the most nearly constant intensity of illumination in spite of voltage fluctuation, only tungsten-filament lamps should be used in coal mines. Weather-proof enameled reflectors are necessary on account of the dampness, smoke and dirt. The reflectors in the bottom should be cleaned at least twice a week, and those farther in the mine not less than once a week.

The installation just described has proved highly satisfactory. With the adoption of modern methods of illumination by some of the more representative mines, considerable improvement may be looked for everywhere in the lighting of this important branch of industry.

Separable Cable Connector

Very often in electrical work separable cable connections are desirable, especially in testing work or in making temporary connections. A mere makeshift is oftentimes worse than useless and may result in damage. The accompanying illustration shows a connector which is as simple as it is useful and possesses the advantage that when insulated it can be dragged about the floor with impunity. The cable ends to be connected are bared in the usual manner and inserted in

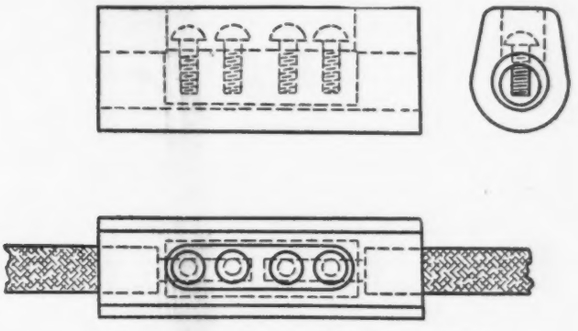


DIAGRAM OF SIMPLE CABLE CONNECTOR

the device, where they are held in place by duplicate set screws. For insulation a piece of rubber hose slightly larger in inside diameter than the connector is slipped over the device after one cable end is connected, and when the other cable end is inserted and fastened the hose is centered over the connector. It can then be held in place by ordinary friction tape.

Recent Telephone Patents

A combined jack and mechanically restored drop has been patented by Mr. R. M. de Vignier, of Hollis Terrace, N. Y., his patent being assigned to the Western Electric Company. The tubular drop shell carries a lug which supports the jack springs. This shell is secured to the rear of a face plate to the front of which the shutter is fastened. A restoring spring is elevated through the deflection of one of the jack springs as a plug is inserted.

Mr. Louis Steinberger, of Brooklyn, N. Y., has patented an improved receiver shell, the cap end of which is molded within a threaded metal ring adapted to register with a corresponding internally threaded metal ring molded into the cap piece.

A combined advertising and mouthpiece-closing device for transmitters is the invention of Mr. C. Ross, of Chicago. This consists of a sheet-metal cover adapted to clamp upon the mouthpiece.

Letters to the Editors

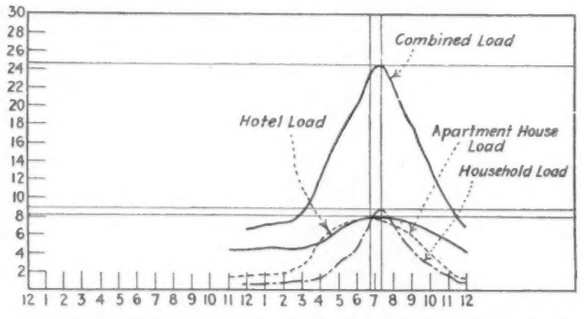
Discrimination in Public Service Rates

To the Editors of the Electrical World:

SIRS:—At its recent June session the National Electric Light Association officially approved a principle or basis for rates for energy for lighting and motor service, in accordance with which "charges should be based on the value of the service to the user" and this value "should be determined by the amount at which the customer could serve himself."

The accompanying typical curves illustrate roughly the relative amounts of energy delivered to household, apartment and hotel customers of a central station during the peak hour at about 7 p. m. All of the energy is produced by the same engine, with the same fuel and supplies, and transported on the same wires at the same time. Each kilowatt-hour costs approximately the same amount whether it is consumed by those who live in private homes, apartments or hotels.

In Denver, Indianapolis, New York, and generally throughout the entire country, rates for electric energy vary from 2 cents to 10 cents per kw-hr., the lowest invariably being offered to hotels and apartment houses, and the highest to isolated domestic consumers—a difference of 400 per cent in the charge made for like and contemporaneous public services rendered "under similar circumstances and conditions."



CURVES SHOWING RELATIVE DISTRIBUTION OF ENERGY

The difference in the rate to the single householder and to the hotel or apartment customer is obviously based on the impracticability of the isolated family "serving itself"—or, in commercial phraseology, on "competition." The customer whose limited use does not justify the installation of an independent plant pays the highest, while the hotel or apartment which offers this (potential) competition invariably secures the lowest rate. Yet competition does not afford excuse for discrimination, since public service operations "are for the common and equal benefit of all persons wishing to avail themselves of the facilities which they afford." (Hardy vs. Cleveland & Marietta Railroad.) "This principle of equality forbids any difference in charge which is not based on a difference in service, and even when based on a difference in service must have some reasonable relation to the amount of the difference and cannot be so great as to produce unjust discrimination." (Western Union vs. McCall Publishing Company.)

The National Electric Light Association has gone on record as indorsing a principle for electric energy rates —"the value of the service to the user"—which manifestly means "unjust discrimination" and ignores or violates accepted judicial rules for making public service rates. According to fundamental accepted judicial opinion, all public service rates "must have some reasonable relation to the amount of difference" of the cost of the service rendered, and the value of the service "to the user" does not warrant any difference whatever in the rates which such a corporation is authorized to impose.

The announcement of the "use value" theory as the basis of electric rates quickly developed a champion—the occasion afforded the opportunity to project the public utility into municipal politics. Mayor Blankenburg of Philadelphia has proposed a municipal league "which shall constitute an offensive and defensive alliance among the cities." The league has been formed to insure that rates and service for public utilities shall hereafter be based on the actual cost of providing and furnishing such services and "not on the power of a monopoly to extort what rates it will."

The domestic and isolated consumer is no less alive to the social injustice of selling a public service product, "under similar circumstances and conditions of cost," at prices which discriminate against him by 400 per cent. Whether the individual lives in a hotel, an apartment or an isolated house makes little difference in the cost of the energy which each class uses, and any attempt to impose a discrimination of 100, 200 or 400 per cent in price is obviously "unjust" and can hardly be defended either in social or political law.

Toledo, Ohio. H. W. ASHLEY.

Simplified Hyperbolic Calculations for Transmission Lines

To the Editors of the Electrical World:

SIRS:—The article by Mr. H. B. Dwight appearing on page 473 in the issue of the *Electrical World* for Sept. 5 is interesting as showing the different ways in which one and the same numerical problem may present itself to different engineers for solution. One computer will select one method of attack and another another. These preferences are likely to be found in all branches of applied mathematics and engineering. They will naturally depend upon the personality, training and mental habits of the different workers. The method cited in the article, following the line proposed in 1909 by Prof. T. R. Rosebrugh, will doubtless be useful in many practical cases, especially in dealing with transmission lines at ordinary working frequencies. The formula given is that of a hyperbolic cosine expanded in the form of a series according to Taylor's theorem, and with only a very few terms retained as necessary in such favorable cases.

It seems desirable in a discussion of this nature to consider more particularly the points under consideration on which all parties are likely to agree, and to eliminate, if possible, the matters on which differences of opinion are likely to multiply. We may perhaps all be able to agree to the following propositions if I correctly interpret the article of Mr. Dwight:

(1) The simplest fundamental formulas relating to high-frequency, long, uniform alternating-current lines in the steady state essentially involve hyperbolic functions.

(2) On short lines, at low frequencies, these formulas may be much simplified by expansions such as those of Professor Rosebrough or those of Dr. Pender.

(3) Ordinary transmission lines, operating at standard frequencies, do not need to be dealt with by hyperbolic formulas if higher harmonics can be left out of consideration.

(4) Suitable sectional artificial lines of lumped resistance, inductance and capacity may advantageously be used in the laboratory, for the study of the behavior of actual transmission lines in the steady state.

Cambridge, Mass. A. E. KENNELLY.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Boilers for Peak-Load Conditions

In plants that are to be worked at high rates of evaporation it is important to select only those types of boilers which are free from stress due to temperature changes and which permit of easy renewal of tubes. It has been pointed out by engineers who have given this subject close study that when boilers are to be worked during peak-load periods at from 7 lb. to 10 lb. of water per sq. ft. of heating surface—that is, from two to three times the rating—the total cost of the boiler plant will be so greatly reduced that the very best boiler structure for the purpose can be selected without greatly increasing the cost of the plant. The cross-drum type of boiler offers advantages for high rates of working as the discharge from the upward circulation of steam and water is near the center of the cross drum and therefore near the normal water level, thus liberating the steam near the surface of the water, which permits of freer and more rapid circulation.

First-Aid Equipment for the Injured

BY G. O. SMITH

Every electric-service company should provide itself with equipment for giving relief to injured persons. Many of the first-aid kits which are being employed, however, are cumbersome, unsanitary or else do not contain enough articles to be useful on every occasion. Equipment should be selected which will serve as many purposes as possible. It should be inclosed preferably in a sanitary case, which, to be serviceable, should be small, portable and strongly made.

After investigating the first-aid equipments used by

FIG. 1—LARGE-SIZED FIRST-AID KIT

public utility organizations as well as those obtainable from manufacturers, H. L. Doherty & Company, New York City, have designed two sets which combine the advantages of all. One is a large kit intended for use in generating stations and substations or where construction work is going on. It can also be carried on service trucks with a pulmotor to answer emergency calls. The other set, which is intended for use where the complete outfit would not be required, can be carried in the pocket or attached to a motorcycle when the trouble-man is provided with this means of transportation.

The large kit, which weighs only 3.5 lb., consists of

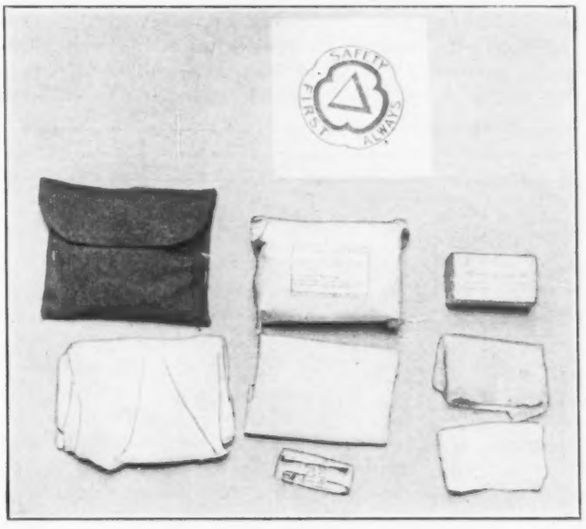


FIG. 2—SPECIAL FIRST-AID PACKAGE

forty articles inclosed in a strong metal case measuring 8.25 in. by 5.5 in. by 4.25 in. In the case are the following articles: Five collapsible drinking cups, one pair of wooden-tongue forceps, two sealed towels, one case of twelve vials of "Vaporole" aromatic ammonia, one jaw wedge, six 3-yd. rolls of 2.5-in. gauze, five 3-yd. rolls of 1-in. gauze, two 0.25-oz. tubes of "Borofax," two 0.25-oz. tubes of carron oil, two 2.5-yd. rolls of 0.5-in. adhesive plaster, one special first-aid package, four 0.25-oz. rolls of absorbent cotton, one 1-oz. package of sodium bicarbonate, one 2.5-yd. roll of 1-in. zinc-oxide adhesive plaster, one tourniquet, two tubes of effervescent sodium phosphate, one 1-oz. vial of aromatic spirits of ammonia, one spoon and one book of first-aid instructions.

The pocket-size kit weighs only 1.5 lb. and measures 7.5 in. by 1.875 in. by 4.5 in. It contains five drinking cups, one pair of tongue forceps, one towel, one case of twelve vials of "Vaporole" aromatic ammonia, one jaw wedge, two 3-yd. rolls of 2.5-in. gauze, two 3-yd rolls of 1-in. gauze, two 0.25-oz. tubes of "Borofax," two 0.25-oz. tubes of carron oil, one 2.5-yd. roll of 0.5-in. adhesive plaster, one first-aid package, one 0.25-oz. roll of cotton, and one instruction booklet. The same sizes of units are employed in both sets to simplify the task of restocking the outfits.

The special first-aid packages included in each of the aforementioned kits consist of a jaconet inclosing one triangular bandage, two sublimated-gauze compresses, one cambric bandage and two safety pins. Each employee may be equipped with one of these packages, which can be used to give temporary relief to an in-

jured person when the more complete kits are not available. The jaconet, which is made of special linen, protects the contents of the package from infection.

In order that each kit may be kept perfectly sanitary, only enough material is included in each unit for one dressing. The cases are sealed by the claim department or supervisor of safety of each company and are then distributed to the various departments. Whenever a kit is used the seal is necessarily broken, and hence it must be returned at once to the general office for replenishing. In the meantime a fresh kit is substituted so that there is always a complete kit on hand.

Overcoming Difficulties in Paralleling Generators

Special switching apparatus is installed in the municipal electric plant at Owensboro, Ky., to facilitate paralleling the older reciprocating engine-driven units (rated at 300 kw and 500 kva) with the newer turbine-driven generator (rated at 1250 kva). This apparatus was required as it had proved impossible to raise the

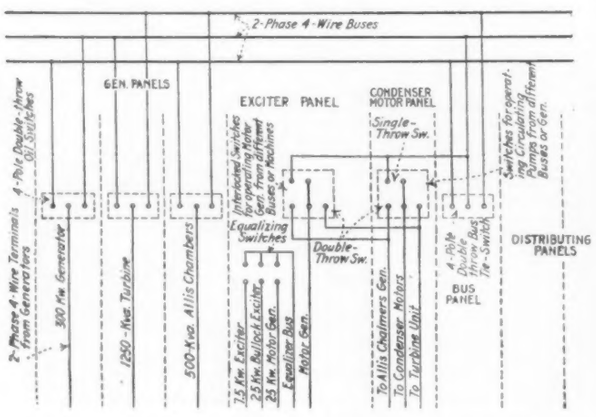


FIG. 1—DIAGRAM SHOWING SWITCH CONNECTIONS

frequency of the loaded reciprocating units to that of the incoming turbine-driven set, while, on the other hand, the turbine governors would not permit of lowering the turbine speed sufficiently for synchronizing. The system employed to synchronize the machines is to subdivide the distribution circuits into lamp and motor feeders so that the load may be divided between the

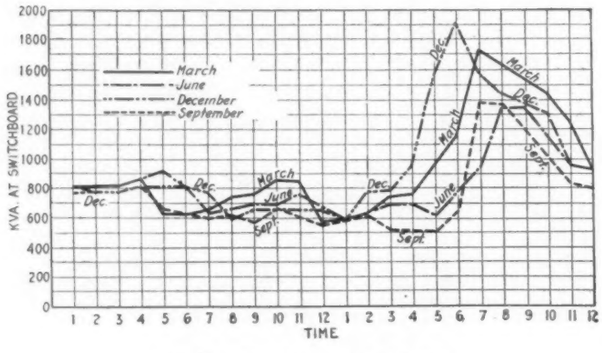


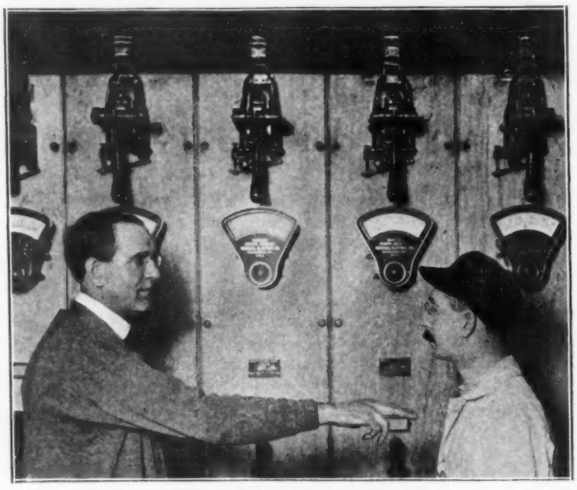
FIG. 2—TYPICAL LOAD CURVES

loaded and incoming machines to make their frequencies correspond, after which the units can be easily synchronized. In dividing the load before paralleling the machines only the lamp circuits are thrown over onto the incoming machines since in this way none of the synchronous apparatus need be thrown out of step and the lamps are subjected to only a momentary interruption of energy.

The switching equipment for the operations described above is shown in Fig. 1. It consists of (1) three sets of four-wire two-phase buses, one for each generator when operated separately or prior to synchronizing; (2) four-contact double-throw oil switches for each generator, permitting the connection of each unit to either one of two buses; and (3) a four-pole double-throw bus-tie switch. Each feeder switch is also arranged to feed its circuit from either one of two buses. These switches are connected so that load may be distributed over the three buses. Typical daily load curves for different times of the year are shown in Fig. 2.

Don't Point at Anything Electrical

Pointing at electrical apparatus is dangerous, for the man making the gesture may overestimate the distance of the object singled out or his arm may come in contact with some other energized apparatus while his attention is distracted. The Rochester (N. Y.) Railway & Light Company has therefore instructed its employees not to point at anything electrical. When a man feels that he must point it should be at the person spoken to. The accompanying illustration, which



THE ONLY WAY TO POINT

shows pictorially the correct way to point—if point one must—is posted in conspicuous places about the system and leaves a more lasting impression in the minds of employees than would result from verbal instructions on the same subject.

Effect of Reactance on Low-Power-Factor Feeder Circuits

Is it advisable to install protective reactors on feeder circuits feeding heavy induction-motor loads? How will the regulation be affected? S. C. L.

Reactors placed on low-power-factor feeder circuits affect the regulation by increasing the line drop to a greater extent than on high-power-factor circuits. In general, the higher the reactance, wherever placed, the poorer the regulation. To avoid trouble from this source a short-circuiting switch is oftentimes installed to shunt the reactor. This switch is provided with an automatic instantaneous device to open the switch and cut in the reactor in case of short-circuit. This arrangement is open to the objection that it does not protect the system from shock when surges occur. Better operating results will be obtained by improving the power-factor of the system. The main generators by this means will also be able to carry more load.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Magnetizing Current in Alternating-Current Magnet Systems.—RUD. CZEVEK.—In presence of iron the magnetizing current of an alternating-current system is not sinusoidal on account of change in permeability. The author describes an approximate method of calculating the magnetizing current if the static magnetizing curve is known. The author makes use of the fact that the distortion of the magnetizing current is chiefly due to the third harmonic.—*Elek. u. Masch.* (Vienna), Aug. 2, 1914.

Operating Characteristic Curves.—An article by C. A. M. Weber giving operating characteristic curves of squirrel-cage and wound-secondary induction motors from actual tests, and an article by K. L. Hansen and C. G. Lewis on the speed characteristics of direct-current series, shunt and compound motors.—*Elec. Journal,* September, 1914.

Transformer Design.—H. DE PISTOYE.—An illustrated article on the calculation of the cooling surface of an oil transformer, giving a practical method for the calculation.—*La Lumière Elec.,* July 18, 1914.

Engineering Evolution of Electrical Apparatus.—In the present instalment of this illustrated serial J. S. Peck discusses the evolution of the transformer.—*Elec. Journal,* September, 1914.

Mercury Vapor Converter.—MAURICE LEBLANC.—An English translation of his French article on recent developments of the mercury-vapor converter in Europe and America.—London *Electrician,* Aug. 14, 1914.

Lamps and Lighting

Starting Current of Half-Watt Lamps.—A. J. MAKOWER AND U. A. OSCHWALD.—An account of an experimental investigation of the starting currents of two half-watt lamps, namely, a 1500-watt, 100-volt lamp and a 500-watt, 100-volt lamp. The resistances of these lamps measured cold were 0.5 ohm and 1.8 ohms, which would give maximum possible initial currents of thirteen and one-third and eleven and one-tenth times the respective normal currents. The actual maximum values of the currents obtained when switching on are about 70 per cent of these values. The oscillograms for the starting currents of the two lamps shown in Figs. 1 and 2 were obtained photographically by a Blondel oscillograph driven by a special gearing to reduce the speed so as to get the whole starting period recorded on the plate. The maximum currents recorded in these figures are 140 amp and 37.5 amp, or nine and one-third and seven and one-half times the normal currents of the lamps. These figures are somewhat in excess of the values published for the older types of metallic-filament lamps, but the main difference in the behavior of the half-watt lamps lies in the length of time required for the current to reach its steady value. This time appears to be about 0.3 second and 0.2 second respectively for the two lamps under test, the length of time taken for the current to settle down being so much in excess of the time taken for the ordinary metallic-filament lamp with exhausted bulb that circuit-breakers are more liable to operate when switching on. To make the switching on certain the setting of the circuit-breakers must be much higher. In order to test this a circuit-breaker with adjustable time limit was set so as just to operate when switching on the 1500-watt lamp, and tests were made to determine the loads that would just operate the breaker with the same setting, (1) with a load that would give a steady current when switching on, and (2) with a load of ordinary metallic-filament lamps. It was found that with the setting that would just operate with the 15-amp half-watt lamp it took a steady current of 90 amp, continuing for about twelve seconds, or a load of metallic-filament lamps having a steady value of 28 amp, to cause the breaker to operate. Thus it appears that, comparing the adjustment of the circuit-breaker for both the types of metallic-filament lamps with the steady current adjustment, the circuit-breaker has to be set with the exhausted lamps for a current equal to two and two-fifths times the steady load, and with the half-watt lamps for a current equal to six times the steady load. This fact is of some importance in the design of protective gear for circuits supplying energy to half-watt lamps, and will necessitate the introduction of circuit-breakers with a specially long time-lag in their operation.—London *Electrician,* Aug. 28, 1914.

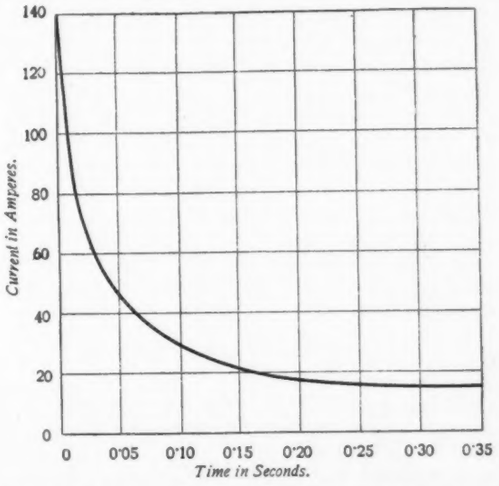


FIG. 1—CURVE SHOWING STARTING CURRENT FOR 1500-WATT, 100-VOLT HALF-WATT OSRAM LAMP

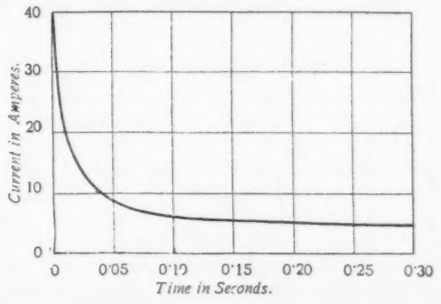


FIG. 2—CURVE SHOWING STARTING CURRENT FOR 500-WATT, 100-VOLT HALF-WATT OSRAM LAMP

Arc-Lamp Electrodes in England.—Practically all of the electrodes in arc lamps used in English cities are imported from Germany and Austria. The (British) General Electric Company is capable of supplying from 10 per cent to 15 per cent of the electrodes used. Since the outbreak of the war its plant has been at work night and day practically manufacturing only for the British Admiralty, but now it is turning its attention to meeting the needs of the railways and the municipal authorities for street lighting. The expectation is to keep going that portion of public street lighting in which the more modern flame-arc lamps are employed. The use of the older open-type arc lamps will perhaps be no longer possible as the stocks of electrodes become exhausted, but in any case they would be superseded by either flame-arc lamps or metallic-filament incandescent lamps in the course of time.—London. *Elec. Eng'ing*, Aug. 27, 1914.

Generation, Transmission and Distribution

Electric Disturbances in Transmission Lines.—DAVID B. RUSHMORE AND ERIC LOF.—A discussion of the disturbances which occur in the operation of transmission lines. In the first part the authors deal with the abnormal conditions resulting from excessive currents and in the second part with the abnormal conditions due to excessive voltage.—*Gen. Elec. Rev.*, August and September, 1914.

Corrosion of Condenser Tubes.—E. BATE.—A critical discussion of the cause of condenser-tube corrosion troubles from the author's experiences. The author's investigation leads him to the conclusion that pit-holes are formed by local action due to electro-negative particles on a surface positive to it. Such conditions can be set up in two ways—first, by segregation in the tube alloy, and, second, by deposit of external electro-negative particles on the tube surface. The author's evidence is in favor of the second explanation. The sea water is drawn in his case through considerable lengths of cast-iron tubing often quite untreated internally and thus liable to continuous corrosion. In this way, for instance, carbon particles may get into the condenser tubes and start corrosion. By paying proper attention to the cast-iron pipe system supplying the sea water the corrosion troubles could be remedied.—*Gen. Elec. Rev.*, September, 1914.

Traction

Signaling on Railway Trains in Motion.—Six brief descriptive papers read by French engineers before the (British) Institution of Mechanical Engineers, giving descriptions of methods in use by various French railways. The Northern Railway (Chemin de Fer du Nord) is dealt with in a paper by A. Sartiaux, who gives a description of the fixed ramp, the electro-automatic whistle on locomotives, and the electro-automatic indicator for trains passing distant signals. The Eastern Railway (Chemin de Fer de l'Est) is covered in a paper by F. Lancrenon, who gives a description of electrical warning and recording apparatus. A. Herdner describes electro-automatic warning and danger signal-recording apparatus on the Southern Railway (Chemin de Fer du Midi). A. Claveille states that on the state railways four safety devices are employed, namely, the Cousin system, the Van Braan system, the Augereau system and the "Est" type of apparatus. These different systems are still in the experimental period. The Paris, Lyons & Mediterranean Railway (Chemin de Fer de Paris à Lyon et à la Mediterranée) is covered in the paper by L. Marechal. E. Solacroup describes audible signals intended to repeat signals along the line, used on the Orleans Railway (Chemin de Fer de Paris à Orléans).—London *Eng'ing*, Aug. 14, 1914.

Railway Signals.—L. KOHLFUERST.—A long and profusely illustrated article on signal systems used in Germany on single-track street railways and light railways to indicate whether there is a car on a certain section of the road.—*Elek. Kraftbet. u. Bahnen*, June 24 and July 4, 1914.

Installations, Systems and Appliances

Limiting Conditions for the Safe Use of Electricity in Coal Mining.—W. M. THORNTON.—A paper read before Section G of the British Association at the recent meeting in Australia. The paper is a summary of recent researches on the limits of electric ignition of inflammable mine gases and coaldust. Electric signaling bells have inductance up to 0.5 henry and ignite gases at the trembler spark or signaling point. All electric lamps and fuses, however small, must be inclosed. Oscillations on a cable sheath caused by short-circuits on the conductor will not ignite gas, but maintained leakage arcs from armoring are only slightly more active than break-sparks. Neither static discharges from 6-in. high-speed belting nor the blue brush discharge from high-pressure conductors could be made to ignite gas. Movements of clouds of dust have been shown to give electrification and to cause sparks, but in order that this shall become dangerous the energy must be much greater than can be obtained experimentally. Wireless-telegraph operations on the surface do not induce sparking potentials underground.—London *Electrician*, Aug. 28, 1914.

Wires, Wiring and Conduits

Air-Break Switch Tests.—W. L. HAMMOND.—Air-break switches have been used for a number of years for opening high-voltage circuits. Owing, however, to their characteristics of producing large, long-sustained, flaring arcs when interrupting such circuits, electrical engineers have been reluctant to use them on important lines. Their characteristics require great spacing between adjacent phases for satisfactory isolation and also a comparatively long time for successful circuit interruption. It has, therefore, been the standard practice to use oil-break switches for practically all important switching operations, since they will successfully confine an electric arc to narrow limits and thus permit a great concentration of power-control apparatus and a more rapid interruption of the circuit. The recent development, however, of the small outdoor substation has opened an extensive field of application for air-break switches. In this case the low first cost of maintenance and simplicity of operation of the air-break switch makes it ideal, since it is used only occasionally for operations equivalent to emergency service. The author gives a description of some air-break switch tests conducted at Gainesville, Ga., for the Virginian Power Company. The switches tested consisted of one 110,000-volt switch and four 44,000-volt air-break switches of different types.—*Gen. Elec. Rev.*, September, 1914.

Electrophysics and Magnetism

Effect of a Longitudinal Magnetic Field on Spark Potentials.—R. F. EARHART.—An account of an experimental investigation. The chief results are as follows: Spark potentials for pressures above the critical pressure are unaffected by a longitudinal field. Spark potentials below the critical pressure are decreased by a longitudinal field. When the pressure exceeds the critical one the existence of a longitudinal field requires a higher potential to maintain the discharges than if no field existed. These variations are increased with increasing fields and become larger as the gas pressure is increased.—*Phys. Rev.*, August, 1914.

Hardening Steel.—ANDREW MCCANCE.—A (British) Iron and Steel Institute paper in which the author gives an account of an experimental investigation into the variations in the properties (electric resistance, remanent magnetism, etc.) of steel of different carbon content, with the temperature of quenching, and investigates theoretically the actions which take place during the quenching.—London *Eng'ing*, June 12, 1914.

Electrochemistry and Batteries

Copper Leaching.—Abstracts of several papers presented at the Utah meeting of the American Institute of Mining Engineers on extended experimental work made in recent years on the leaching of copper ores. Among the methods of precipitating the copper from the solution electrolytic precipitation is discussed and compared with other methods.—*Met. and Chem. Eng'ing*, September, 1914.

Units, Measurements and Instruments

Instruments.—J. REYVAL.—The conclusion of his illustrated report on the recent annual exposition of the French Physical Society. In the present instalment descriptions are given of apparatus exhibited by Da and Dutilh (insulation tester, voltmeters and ammeters, frequency meters) and of apparatus exhibited by J. Carpentier (recording micro-galvanometer of Abraham, induction phase meter of Ferrié and Pestarini, a direct-reading instrument for measuring the resistance of rail joints, large-scale ammeters and voltmeters for switchboards, 100-megohm ohmmeter, universal electrodynamometer and synchronizing apparatus).—*La Lumière Elec.*, July 4, 1914.

Measuring Instruments.—E. STACH.—An illustrated description of new measuring instruments for determining the pressure, speed and density of gases. An instrument for analyzing the ammonia content of liquids is also described.—*Glückauf*, Aug. 1, 1914.

Telegraphy, Telephony and Signals

Experimental Studies of a Telephone Receiver.—LEON BOUTHILLON AND LOUIS DROUET.—An account of an experimental investigation in which the displacement or vibration of the diaphragm of a telephone receiver under the action of an electric current was studied by fixing a little pin in the center of the diaphragm perpendicular to its surface and observing in the microscope its displacement or its vibrations. The authors studied the displacement of the diaphragm under the action of direct current, then the vibration of the diaphragm when sinusoidal alternating current was passed through the receiver winding, and finally the sensitiveness of the telephone receiver.—*Comptes Rendus*, June 2; *La Lumière Elec.*, July 4, 1914.

Resonance Telephone Receiver.—M. ALIAMET.—At the exposition of the French Physical Society the Camillerapp "resonance telephone receiver" was exhibited. As shown in Fig. 3, it consists of a vibrating diaphragm

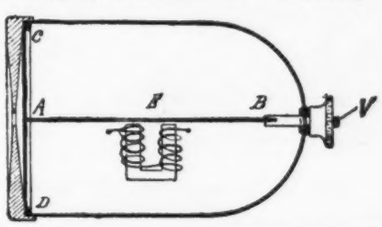


FIG. 3—DIAGRAM OF "RESONANCE TELEPHONE RECEIVER"

CD, the center *A* of which is connected with the steel wire *AB*, the tension of which can be adjusted by means of a screw *V*. The telephone magnet and its coils shown at *E* act on the wire *AB*, which transmits its vibration to the diaphragm *CD*. The vibrations are amplified by this method, which is analogous to that used in hot-wire voltmeters. By varying the tension of the wire it is possible to regulate the frequency proper of the diaphragm and to produce resonance for current of a given frequency.—*L'Electricien*, July 25, 1914.

Wireless Telegraphy.—A map showing the wireless-telegraph stations in America with special reference to Central America and South America.—*Elek. Zeit.*, July 30, 1914.

Wireless Telegraphy.—CAPTAIN FRACQUE.—The first parts of his lecture delivered before the officers of a regiment of the French Engineers' Corps. In the first instalments the author sums up various mathematical theorems the knowledge of which is necessary for a clear comprehension of the theory of wireless telegraphy.—*La Lumière Elec.*, July 25 and Aug. 1, 1914.

Book Review

APPLICATION OF ELECTRIC POWER TO MINES AND HEAVY INDUSTRIES. By W. H. Patchell. 333 pages, illus. New York: D. Van Nostrand Company. Price, $4 net.

This book is the outcome of a special course of lectures delivered by the author at King's College, University of London. It treats in a practical manner of the machinery and systems of distribution of special interest to the electrical engineer who specializes in mining work or who is interested in the applications of electricity to steel works or to machine tools. The last chapter in the book treats briefly of electric welding and electric furnaces. As indicated by the title, the writer is concerned with the applications of electric power and not with the theories of electric phenomena. Reference is made to the laws and regulations governing the use of electricity in mines. Such information is not only interesting but essential to the engineer engaged on the electrical equipment of mines; and this—and, indeed, other sections of the book also—is, of course, of special interest to the British engineer, since it is the practice of Great Britain that the author has mainly in mind. It is not suggested, however, that the book may not be of great interest to engineers in every part of the globe, notwithstanding that the installations referred to or illustrated are mainly in Great Britain or on the continent of Europe. There is an unfortunate tendency among engineers to suppose that the general practice in a particular country or district is necessarily the best under the conditions there encountered, whereas the fads of the day, the machines held in stock by local manufacturers and the want of initiative on the part of the engineer himself are frequently factors of considerable importance in the choice of plant or system. For these reasons a book such as the one before us, although it may treat the subject from the European point of view, should be welcomed by American readers. The language is clear and the descriptions simple and to the point, while the illustrations are on the whole excellent. The ground covered includes cables, coal cutters, hauling gears and winding engines, ventilating fans, air compressors and pumps. Chapter X is devoted to rolling mills, and it includes references to the reversing rolling-mill equipment of the Algoma Steel Company, of Sault Ste. Marie, Ontario, and to the continuous rail mill at Gary. Chapter XI treats exclusively of the applications of electricity to machine tools, cranes and heavy lifting magnets. The amount of ground covered is considerable, and the treatment is necessarily far from being exhaustive; but the material is well arranged and presented in an attractive manner.

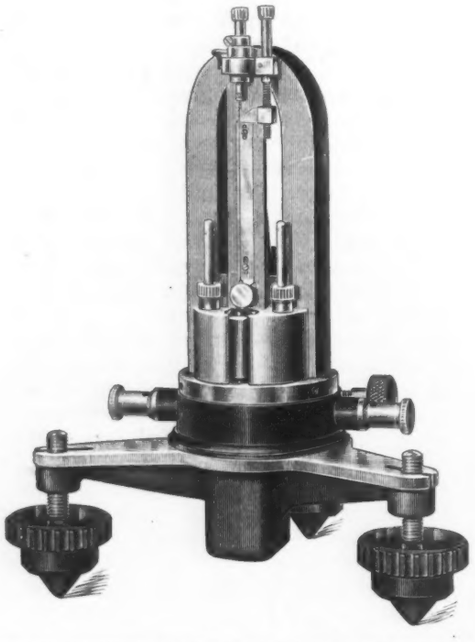
New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

High-Sensitivity Galvanometer

A high-sensitivity galvanometer of the D'Arsonval type is shown in the accompanying illustration. It is claimed by the manufacturers that with an instrument of 12 ohms internal resistance and an external critical damping resistance of 25 ohms in series a sensitivity per microvolt of 11 mm on a scale one meter away can be attained. The period of this instrument is 7.5 seconds. For work involving a high-resistance galvanometer it is declared that a sensitivity of 1 mm per volt across 10,000 megohms can be attained. The period for this instrument is 17.5 seconds.

The magnet is of steel with pole pieces of Swedish iron so shaped as to produce a radial field. Rough adjustment is effected by a thumb-screw on top of the



HIGH-SENSITIVITY D'ARSONVAL GALVANOMETER WITH COVER REMOVED

instrument. By turning a second thumb-screw on the base of the galvanometer a fine adjustment is secured without jarring the instrument. Under the small cap on the top of the case beside the screw used for rough adjustments is another screw by means of which the coil can be clamped to prevent damage to its suspensions when the instrument is being moved. The galvanometer is inclosed in a cylindrical nickel-plated case with a large window in front. In the illustration this case is removed. The instrument is mounted upon a hard-rubber base attached to a tripod. The tripod is supported upon three petticoat-insulated leveling screws, which, in addition to the hard-rubber base upon which the galvanometer is mounted, insure high insulation. As the air-gaps are large in comparison to the size of the coil, the instrument, it is declared, is quite easily leveled.

This galvanometer has been developed by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa.

1915 Model Electric Coupé

In the 1915-model, five-passenger car of the Buffalo Electric Vehicle Company, Buffalo, N. Y., the driver's seat is placed in the middle of the car, as shown in Fig.

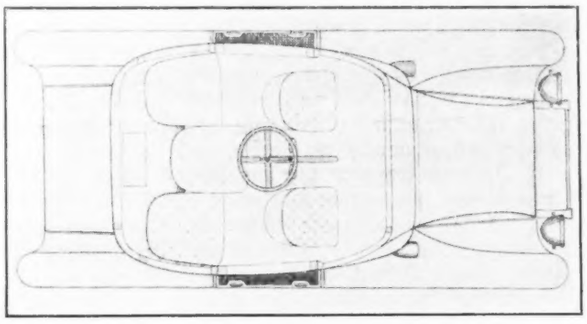


FIG. 1—SEATING ARRANGEMENT OF FIVE-PASSENGER ELECTRIC AUTOMOBILE

1. The control lever on top of the steering wheel is similar to the gas throttle of a gasoline car and is connected to an inclosed drum-type controller at the base of the steering column. In starting, use is made of a foot pedal which closes a switch, connecting the motor with the batteries through a resistance. This resistance is cut out step by step until a speed of 9 miles per

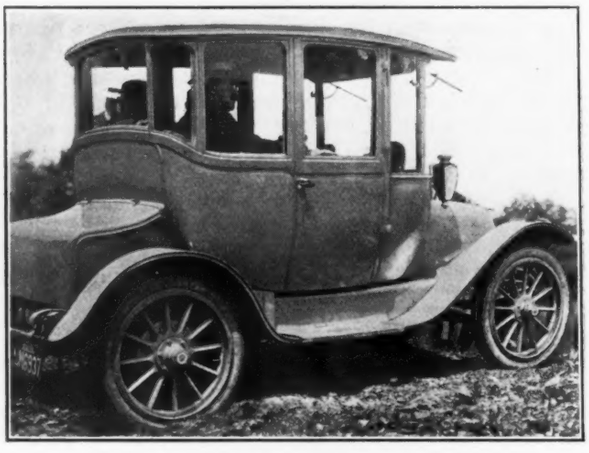


FIG. 2—FIVE-PASSENGER COUPÉ

hour is attained. For speeds above 9 miles per hour and up to 20 miles per hour the drum controller is used. When the foot pedal is pushed forward the energy supply is cut off and the brakes are applied. Five individual seats are provided. The two seats in the front are of the revolving type. On each side of the driver's seat slightly to the rear are two fixed seats.

Shade Holders, Receptacles and Covers for Outlet Boxes

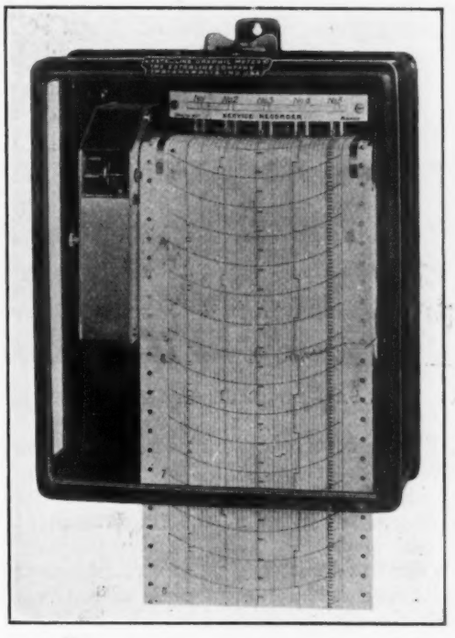
Various types of shade holders, receptacles and covers for outlet boxes have just been placed on the market by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill. The shade holders are made of stamped steel and are held in place by two screws

RECEPTACLE, SHADE HOLDER AND COVER WITH REFLECTOR ATTACHED

which thread into the box cover and keep the porcelain receptacle in place. Three types of holders are available. The receptacles are equipped with either sealed terminals or clamping terminals. The box covers are in 3-in. or 4-in. sizes and are punched and tapped for the receptacles.

Service-Recording Instrument

An electrically operated instrument designed to record the production by machines in factories or the movement of rolling stock on railroads at certain points is being manufactured by the Esterline Company, Indianapolis, Ind. The instrument is equipped with elec-

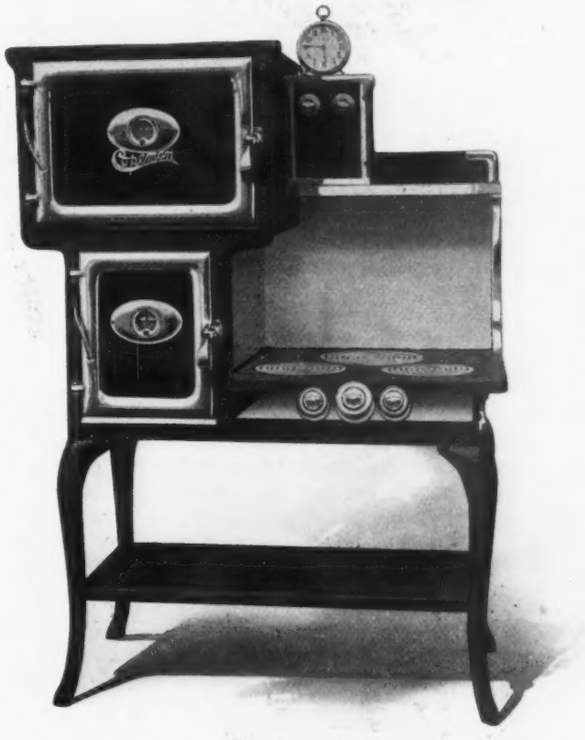


INSTRUMENT FOR RECORDING MACHINE PRODUCTION

tically controlled pens resting on a strip of paper which is driven through the meter at a constant rate by an eight-day clock. When a record is made the pen moves in a horizontal direction about 0.125 in., the pen returning to the zero position when the recording operation is completed. The resulting record is a series of short lines, the spacings of which represent the rate at which operations are finished. This instrument can be installed in an office some distance from the machine. By means of a counting device the total number of operations for a certain length of time can be recorded.

Electric Range with Elevated Ovens

An electric range with two elevated ovens is being placed on the market by the Copeman Electric Stove Company, Flint, Mich. The ovens are 18.5 in. wide, 13.5 in. high and 16 in. deep, and 10.375 in. wide, 13.5 in. high and 11.5 in. deep, respectively, and the larger oven is placed above the smaller as shown in the accompanying illustration. In the larger oven one heating element is used. This heater can be placed in the bottom for baking and boiling or in the top for broiling. This oven has two degrees of heat—high and low—which may be controlled automatically or by hand. A single heating unit is also used in the smaller oven, but



ELECTRIC RANGE

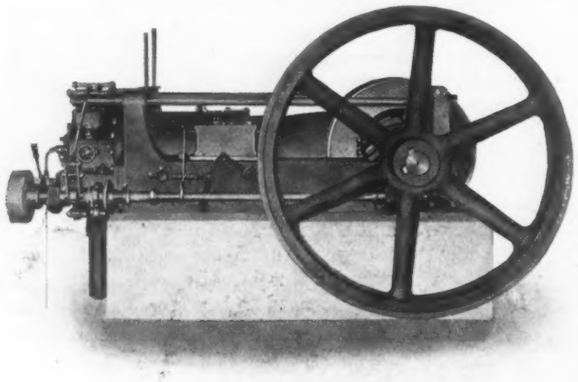
it is employed only for baking and boiling. The platform of the stove is equipped with two 8-in. heaters and one 10-in. heater, each having three stages of heat. The over-all dimensions of this range are: length, 43 in.; height, 59 in., and depth, 25 in., and its weight crated is approximately 400 lb.

Heavy Oil Engine

A horizontal four-stroke-cycle oil engine designed for heavy-duty operation is being made by the Wygodsky Engine Company, 115 Broadway, New York. By using a compression of not more than 300 lb. the manufacturers claim that they have been able to build an engine of comparatively light weight.

The engine bed is braced by steel tie rods which can be seen in the accompanying illustration. These tie rods serve as rails for a small device which acts as a traveling crane, thus permitting one man to replace or

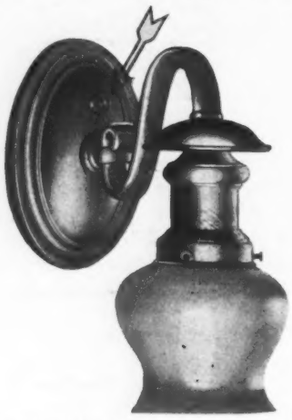
remove heavy parts of the engine. The fuel is atomized by means of a hydraulically operated sprayer. At starting the gases are ignited by a hollow ring inclosed in the water-cooled cylinder head which is heated by a torch burning some of the same fuel used to operate the engine. As soon as the engine has made a few revolutions the heat of the piston plus the heat of the compressed air in the cylinder is sufficient to ignite the oil. The governor is fixed directly to the cam shaft and is so designed that in case the engine should be reversed it automatically cuts off the supply of fuel. One of the features of this engine, the manufacturers declare, is its principle of self-starting.



OIL ENGINE DESIGNED FOR HEAVY DUTY

Canopy Fixture Switches

Formerly with the small push-and-pull canopy switches made by the Cutler-Hammer Manufacturing Company, Milwaukee, the circuit was closed when the button was pushed in, while when it protruded the circuit was open. There has been a demand also for switches operating in just the opposite way, and switches of this type have now been added to the company's standard line. These new switches are for use chiefly on wall brackets controlled with the ceiling chandelier by a wall switch. The wall brackets being used only occasionally, the buttons therefore remain pushed in. When the chandelier is lighted the circuit to the wall brackets is not closed unless the buttons are pulled out. The bracket shown in the accompanying illustration, which was made by R. Williamson & Company, Chicago, is equipped with one of these canopy switches having a reverse mechanism.

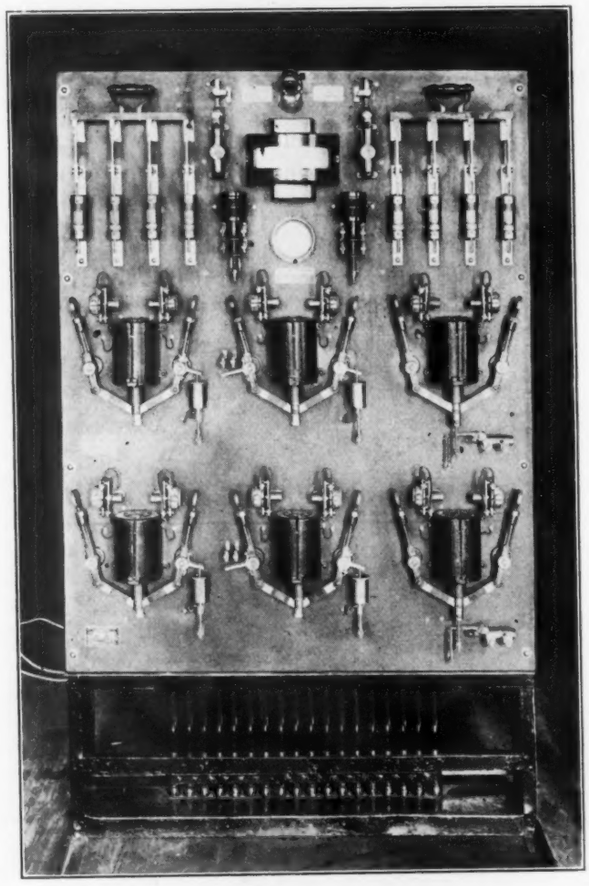


WALL-BRACKET LAMP WITH CANOPY SWITCH

Control Board for Air Compressors

In the accompanying illustration is shown one of two panels recently built by the Automatic Switch Company, 131 Liberty Street, New York, for the Pacific Flush-Tank Company, Chicago, Ill., for use in connection with a sewage-disposal system at Tampa, Fla. Each panel is equipped with two 30-hp, two-phase, slip-ring, pressure-regulating controlling devices.

In the center are shown a pilot lamp, wattmeter and pressure gage. On each side at the top are the Sylphon pilot pressure regulators, which operate on the bellows principle. Immediately below the regulators are single-phase relays for energizing the magnet main-line switches. The magnet main-line switches for the controllers are at the extreme right, and each is provided with a dash-pot "time element" for energizing the magnet of the first resistance-bridging switch shown immediately to the right. This switch is also provided with a dash-pot "time element" for timing the third switch, which is shown in the illustration at the extreme right of the panel.

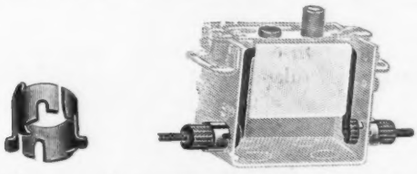


CONTROL PANEL FOR OPERATING COMPRESSORS

When the third switch closes all resistance is cut out, and at the same time a valve is closed, setting the valves of the air compressor which the motor drives, thus putting the load on the motor as soon as all the resistance has been short-circuited. The timing of these switches is easily accomplished by changing the consistency of the oil in the dash-pots. The resistance is of the Whittingham sand-packed tubular type, placed beneath the frame, each unit being separately removable without disturbing the other units. The entire panel is supported by a channel-iron frame and stands clear from the wall without bracing.

Loom Bushing

A bushing designed to hold flexible non-metallic conduit or loom in metal switchboxes or outlet boxes with ⅝-in. knockouts is being made by the Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill. The device consists of a single piece of metal as shown in Fig. 1. No screws or tools are necessary in its installation. This bushing may be inserted either from the inside or outside of the box. If the former, it is installed by pushing the loom in from the outside, spreading the bushing enough to let the sharp points pass over the end of the loom to the desired position, and then closing the bushing together until guiding prongs pass through the hole. A sharp pull on the loom from the outside will then draw the bushing into place. It cannot be pulled entirely through because of stops inside the box. It cannot be pushed back because the elastic fingers bear against the outside of the box. The loom cannot be moved in the bushing because it is held by sharp prongs forced into its outer surface. If it is desired to remove the bushing, the three elastic fingers on the outside of the box are depressed and the process of installing is reversed. To insert from the outside, the bushing is turned around and slipped over the loom, and the loom is then pushed into place from the outside. The bushing is made of spring steel and is plated to prevent corrosion.



FIGS. 1 AND 2—LOOM BUSHING DETACHED AND IN POSITION IN SWITCHBOX

Service Cap

A galvanized-iron service cap for conduit fittings is being made by the Gillette-Vibber Company, New London, Conn. In installing this cap the frame portion is first screwed to the end of a conduit. The wires are then bent down into the two-part insulator, with which the cap is used. The grooves holding the insulator make insulator screws unnecessary. The cover is next applied by loosening one of the screws, placing it on the frame and tightening only one screw. The screws are burred over so that they cannot fall out. This cap can also be employed after the wires are connected if the reduced section in the frame is cut out. The wires can then be slipped through the gap and the cap screwed on the pipe.

GALVANIZED-IRON SERVICE CAP DISASSEMBLED

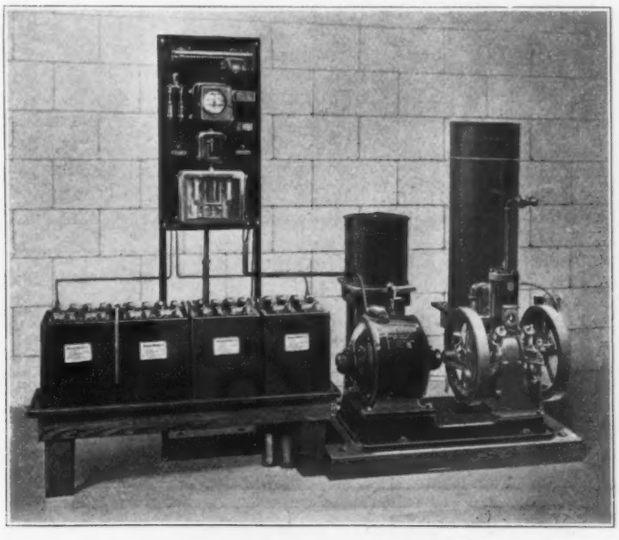
Decorative Outdoor Receptacle

The outdoor receptacle shown herewith was designed for use on the Garden Pier, Atlantic City, and it was glazed a dark brown to harmonize with the tiling. The binding screws are well protected and are center-spaced so that the two wires can be bared at the same place. The wires are carried 1 in. above the surface. Drip holes are provided for the screw shell. The center contacts are of phosphor bronze. This receptacle was made by the H. T. Paiste Company, Philadelphia, Pa., for which the Hart & Hegeman Manufacturing Company, Hartford, Conn., is sole selling agent.

OUTDOOR RECEPTACLE

Small Lighting Plant

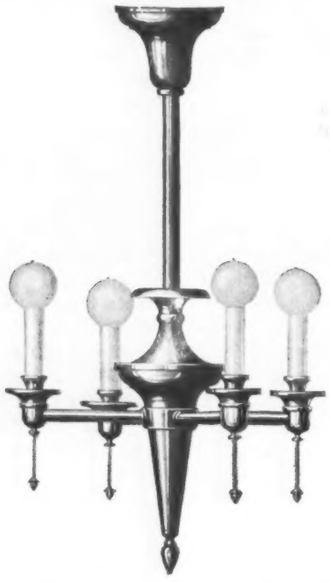
A small lighting outfit with a continuous rating of 900 watts is shown in the accompanying illustration. The engine and generator are direct-connected, and they operate at 750 r.p.m. A sixteen-cell, 80-amp-hour battery is used. The switching mechanism is designed to start the engine and generator when the battery is half discharged or when a heavy load is thrown on the line, regardless of the condition of the battery, and to stop the engine when the battery is fully charged. A warning signal is given in case the engine stops on account of lack of fuel or imperfect ignition. A voltage regulator designed to keep the emf constant within 2 per cent is employed. The total space required by this apparatus is 3 ft. by 7 ft. or 3.5 ft. by 6 ft., and the total weight is approximately 1240 lb. This lighting outfit is being placed on the market by the Strong Electric Company, Des Moines, Ia.



ELECTRIC-LIGHTING OUTFIT

Bottom-Outlet Pull Switches

In the accompanying illustration is shown an application of bottom-outlet pull switches on a multi-arm electrolier. This switch is also well adapted for use on wall brackets equipped with metal candles. The

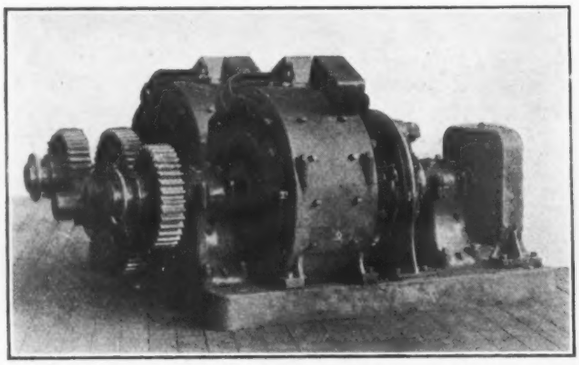


MULTI-ARM ELECTROLIER EQUIPPED WITH PULL SWITCHES

wires are threaded through a tubular supporting arm and thence through a 0.125-in. side bushing to the binding screws of the mechanism. This pull switch is made by Harvey Hubbell, Inc., Bridgeport, Conn.

Electric Steering Motors

For the steering of large ships the Diehl Manufacturing Company, Elizabeth, N. J., has brought out the apparatus shown herewith, consisting of two 150-hp, 120-volt direct-current motors which operate singly or in unison as occasion requires. This apparatus is fitted with clutches so that an auxiliary steam set can be used in case of emergency. The motors can pull the rudder from "hard over" to "hard over," the manufacturers declare, in twenty seconds when the vessel is moving at full speed. Electric brakes are automatically applied in case the armatures are de-energized. When the rud-



MOTORS FOR STEERING LARGE SHIPS

der is turned through 35 deg. it is automatically stopped by a device which cuts off the supply of energy; this does not prevent the motors pulling the rudder back to its central position and returning it to that point.

Screw Shade Holder

A one-piece shade holder which can be screwed onto brass-shelled sockets or receptables is being manufactured by the Bryant Electric Company, Bridgeport, Conn. All the brass-shell sockets and receptacles made

THREADED SOCKET SHELL AND SCREW SHADE HOLDER

by the above company are now equipped with threaded beads which, it is claimed, are as useful as ever for attaching old-style shade holders. In the accompanying illustration is shown a key socket with shell provided with threaded bead and a threaded "Uno" shade holder, as it is called. This shade holder is usually finished in old brass or brush brass, although polished-brass, rich-gilt, gold, silver and sand-blast finishes are sometimes employed.

Pressed Steel Standards

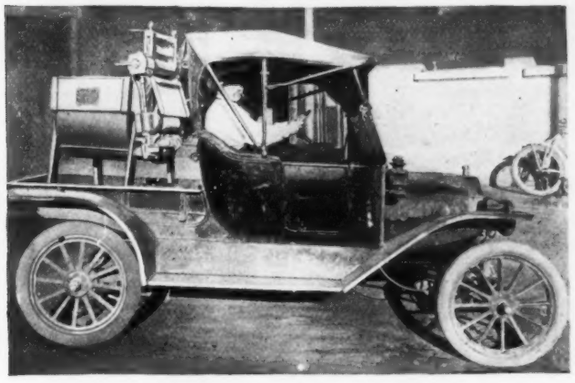
Die-made standards are being placed on the market by the Union Metal Manufacturing Company, Canton, Ohio. The structure of these standards is massive, although the weight is comparatively light. The center of gravity falls within the base. The base, shaft and head are separate. The base is fastened to the ground by steel anchor rods, and the three parts of the standard are held firmly together by three tie rods. The bases, shafts and heads are interchangeable so that it is possible to use a number of different combinations. In the illustration is shown a single-unit standard for high-efficiency tungsten lamps.

Since the advent of the high-efficiency lamps the sectional construction of these standards has made it easy to change from the cluster head to single-lamp units. In like manner, the manufacturers claim, it will be possible to take care of any new arrangement of street lighting that the future may bring forth. The manufacturers also declare that on account of the combined built-up, fluted, pressed-metal shafts, the steel anchor and the tie rods, the standards are shock absorbers, thus insuring safety and long life to the lamps and glassware.

Jobber, Dealer and Contractor

Selling Washing Machines by Automobile

A hustling believer in the value of live advertising is Mr. A. B. Keaton, of Santa Rosa, Cal., an agent of the Western Electric Company, who is reaping the benefits of quick sales, it is said, owing to his practical method of demonstrating washing machines by automobile.



AN UP-TO-DATE WASHING-MACHINE CAMPAIGN

Mr. Keaton travels from town to town with the washing machine in his automobile, as shown in the accompanying illustration. It can be easily removed and taken into the home of a prospective customer for a demonstration or left for a ten or fifteen days' free trial.

Contractors of Louisville Organize

Permanent organization of the Electrical Clearing House of Louisville, which has been loosely organized since last March, was effected at its last meeting. This organization involved adoption of a constitution and by-laws, while the officers previously elected will hold on until the regular annual election, set for next June. Mr. C. C. Childers, of Childers & Waters, is president; Mr. F. G. Burdorf, of the Burdorf-Brecker Company, is vice-president, and Mr. E. C. Knoop, of the Kentucky Actuarial Bureau, is secretary-treasurer.

The objects of the Electrical Clearing House are set forth as follows in one of the articles of the constitution:

"The fostering of trade among the electrical contractors; to reform abuses and to secure freedom from unlawful and unjust exactions; to settle differences between its members; to promote more enlarged and friendly intercourse between its members, and to diffuse accurate and reliable information among its members, better understanding between contractors and inspectors as to interpretation of the code."

The constitution sets forth that "the term 'electrical contractor' shall include all individuals, firms or corporations engaged in the electrical contracting business, also supply houses and local inspectors and representatives of the Louisville Gas & Electric Company." Eligibility is further limited, however, by the provision that before admission the applicant shall have been engaged in business for at least a year, unless some special dispensation is granted by the consent of the membership.

Nominal dues are provided to defray current expenses of the organization, and provision is made for appointment of standing committees which shall look to the publicity side of its activities, while there will be the usual other committees, including one on programs. It is planned to increase the attractiveness of the programs.

Merchandising and Advertising

At the Narragansett Pier convention of the New England Section of the N. E. L. A., Sept. 2 to 4, there was an extended discussion of the report of the committee on merchandising and advertising of the association, as presented at the recent Philadelphia convention. Mr. R. N. Lee, Co-operative Electrical Development Association, New York, commended the space given in the report to window displays. He touched upon the large number of house-lighting campaigns now under way in New England which are bringing forth good results and advocated the demonstration rather than the sale of supplies directly by central stations. Mr. A. P. Maynard, Boston, outlined the relations between customer, buyer, salesman and advertising mediums, urging the selection of electrical goods as wedding presents and speaking from the standpoint of experience in the jewelry trade. An electric kitchen has been established in the Dexter Building, Boston, to facilitate merchandising. Mr. E. R. Davenport, Providence, R. I., recommended selling appliances at list prices and criticised jumbled displays. He commended using national advertising in windows. The profit on sales of portable lamps at Providence pays the rent of the Narragansett company's electric shop. Six thousand electric flatirons marketed at $3.50 have been sold on the basis of $1 down and 50 cents per month. The company designates a week each year in which appliances are sold at half price, and during this week 1130 electric stoves were marketed.

Central Station Co-operates with Contractors to Wire Old Houses

The Louisville (Ky.) Gas & Electric Company has been conducting an old-house-wiring campaign in which its solicitors have until recently turned over all contracts to one electrical contractor for execution. This arrangement, as might be expected, did not meet with the favor of other contractors who were receiving no benefit, so the contracts are now divided among all members of the local Electrical Contractors' Association.

The electric-service company's new-business solicitors continue, as they have been doing since the campaign started in February, to make estimates on house-wiring installations and to sign contracts. These are turned in to the manager of the commercial department, who apportions them among the association contractors. A record is kept of all business sublet in this manner so that any contractor participating in the campaign may get for himself any desired information regarding this matter.

Meetings are held at the company's office every Saturday afternoon, at which the contractors and solicitors are brought into contact and have an opportunity to discuss matters which may be of benefit to both. Under the old arrangement, whereby all of the work went to one concern, operations were hampered somewhat by the activities of the other contractors. Now, however, there is a tendency to leave the electric-service company's solicitors alone in the field while the contractors center their efforts on business houses and new construction. The solicitors canvass only the territory along old distribution lines and do not attempt to secure contracts for wiring new houses or buildings along recent extensions to the distribution system. From the time the campaign started up to the first of September, 1645 contracts, valued at $71,322, were secured. Relations between the electric company and the contractors are pleasant and the best of feelings prevail.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Lamp Company's Increased Business.—The Lux Manufacturing Company, 1328 Broadway, New York, has noted an increase in its tungsten-lamp sales, which is said to result on account of the European war and the consequent elimination of German and Austrian competition.

Electrical Exhibit at the Panama-Pacific Exposition.—Mr. W. J. Marland, electrical and mechanical engineer, Oakland, Cal., will have on exhibit in the palace of machinery at the Panama-Pacific International Exposition various electrical and mechanical appliances. This exhibit will be in charge of salesmen who are linguists and will be able to talk with foreigners interested in the devices on display.

Electricity to Operate Gasoline-Engine Display.—The irrepressible electric motor is used to operate a gasoline engine for window display purposes in a New York gas-engine dealer's store. The engine, which is of the four-cylinder marine type, is mounted conspicuously on a platform with a propeller connected to its moving shaft. Belt-connected to the flywheel is a small motor placed beneath the platform.

New Refrigerator Company Working on Improvements.—The Montclair Refrigerating Corporation, Woolworth Building, New York, which was formed last February, has been busy all summer making improvements on its electrically operated refrigerator until now the apparatus is about as complete as the manufacturers can make it. A large number of orders have been received, which presages well for the company's future business.

Home Exhibition One-Tenth Electrical.—An exhibition devoted to the exploitation of foods and household appliances was recently held at the Coliseum in Chicago and was well patronized by manufacturers of domestic electrical appliances. Motor-driven washing machines, ironers, pianos and vacuum cleaners were displayed in many booths, and the fact that approximately one-tenth of the exhibit space was occupied by these devices indicates how wide awake are the manufacturers of these household goods.

Dish-Washing Machines for Department-Store Restaurants.—The Bromley-Merseles Manufacturing Company, Broadway and Thirty-fourth Street, New York, is selling a number of its large-sized, electrically operated dish-washing machines to hotels, restaurants and hospitals. Installations have recently been made in the stores of Lord & Taylor, Stern Brothers and B. Altman & Company, all of New York. These machines are often featured in conjunction with other electrical apparatus to exemplify the progressiveness of the firms.

Mississippi Valley Co-operation.—Addressing the Chicago Jovian League on Sept. 21, Mr. M. B. Trezevant, general manager of the New Orleans Association of Commerce, said that New Orleans is willing to co-operate with Chicago and the Central West to establish a great banking and trading corporation to foster export trade, particularly that with Central America and South America. He said that New Orleans has a serious purpose in establishing intimate relations with the manufacturing and banking interests of Chicago and the Central West.

Banking and Credit in South America.—A bulletin has been issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce, giving information on the banking systems maintained in Argentina, Brazil, Chile and Peru. The bulletin contains lists of the principal foreign and native banks in these countries, a brief description of their monetary systems, a summary of their foreign trade, a brief outline of their banking laws, and a discussion of banking practice, credit-information service and exchange methods. A chapter is also devoted to a discussion of the various methods suggested for establishing American banks in these countries and their field of operation.

Gas-Filled Tungsten Lamp Contract Awarded.—The Lincoln Park Commissioners, Chicago, Ill., have awarded a contract for 3000 15-amp, 400-cp gas-filled tungsten lamps, dividing the order equally between the Westinghouse Lamp Company and the Edison Lamp Works of the General Electric Company. Quoting on the entire 3000 lamps, all bidders asked $4.15 a lamp and offered 31 per cent discount. Since the order has been divided, however, it is understood that the discount will be reduced to 29 per cent. Delivery of the first 200 lamps is to be made within two weeks of the date on which the contract was awarded, 100 lamps a week being furnished thereafter till 1000 are delivered, and the remainder are to be supplied at the rate of fifty lamps a week. Mr. Claude H. Shepherd, electrical engineer for the Lincoln Park Commissioners, says that specifications for compensators to be used with these lamps have been practically completed.

Silent-Call Signal System for Hospitals.—A lamp signal system designed particularly for use in hospitals has been developed by the Bryant Electric Company, Bridgeport, Conn. The patient presses a push-button attached to the end of a cord which simultaneously lights incandescent lamps at various points—outside the room or ward door, at the nurse's desk, and elsewhere if desired. The registration of the call is indicated to the patient by an illuminated bull's-eye. All the signal lamps incident to a given call remain lighted and cannot be changed until reset by the attendant at the calling station by the bedside where the call originated. Thus a check can be maintained on the attendant's service and those in charge can determine whether the patients are receiving proper attention. Among the hospitals using this system are the Samaritan Hospital, Troy, N. Y.; the Swedish Hospital, Minneapolis, Minn.; the Lakeside Sanitarium, Oshkosh, Wis.; the Robert W. Long Hospital, Indianapolis, Ind., and the Cincinnati General Hospital, Cincinnati, Ohio.

Waterwheels for Many Uses.—Among the more important and recent sales of the Trump Manufacturing Company, Springfield, Ohio, are those to the Susquehanna County Light & Power Company, for three low-head wheels with overhead harness work; the United States Government, for four special turbines to be installed at Lock 7 and Lock 9 on the Ohio River, and the Bark River Electric Light & Power Company, Sullivan, Wis., for two turbines with bevel-mortise gears and harness. Other purchasers were the Whiting-Plover Paper Company, Menasha, Wis., three 62-in. vertical wheels; the Oswego River Paper Mills Company, one 56-in. wheel, and the Yeazell Baldwin Flouring Mills and the M. R. Grinnell Flouring Mills, one unit each for flouring mills in villages near Springfield, Ohio. This company has also just received an order for five large-sized turbines and accessories from Karachi, India. For this order the company had to compete with German manufacturers, who, however, were eliminated on account of the European war. It is expected that this equipment will be ready for shipment Dec. 1.

Lake Copper Versus Electrolytic Copper.—In a paper entitled "The Commercial Classification of Refined Copper" read at the Chicago convention of the American Institute of Metals on Sept. 10, Mr. Lawrence Addicks, of Douglas, Ariz., in comparing Lake copper and electrolytic copper, said: "It is now generally admitted that high-conductivity Lake copper cannot be distinguished from electrolytic copper, while low-conductivity Lake is really an alloy of copper with arsenic, which has certain desirable properties for special uses." Mr. G. H. Clamer, of Philadelphia, asked

why Lake copper sells at a premium over electrolytic if there is no actual difference. Mr. W. H. Bassett, of the American Brass Company, Waterbury, Conn., in answer said that the electrolytic people contend that there should be no premium. The Lake people have argued that inasmuch as Lake copper is a natural deposit it has a longer grain than the electrolytic. Mr. Bassett thinks that probably the whole difference lies in the care with which the product is handled in the refining process. Buyers soon ascertain by experience the reliability of the producers.

Model Home Electrical Kitchen for New York Show.—Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York, manufacturers of electric ranges, will have on display at the electrical show in New York, Oct. 7-17, a model kitchen equipped with electric range, electric dishwasher, cook's table with electric plate warmer, electrically heated steam table, electric refrigerator and ice-making machine and other up-to-date apparatus. Emphasis will be placed on efficient arrangement of the different appliances. It is the contention of Mr. Wells, of the above firm, that the kitchen of the average home is not what it ought to be and in most places it is fifty years behind the times. With the kitchens in most hotels, he states, it is different, and the hotel managers have made the most of their equipment and the space available. In the salesroom of this firm at the above address there is a model hotel kitchen equipped with various electrical devices. Frequent demonstrations are made to chefs of leading hotels and other interested persons to point out the advantages of electricity for cooking purposes.

The Recently Organized Wisconsin-Minnesota Light & Power Company.—Some further information of interest in relation to the new Wisconsin-Minnesota Light & Power Company is given in the recent annual report of the American Public Utilities Company, to which the former company is subsidiary. The Wisconsin-Minnesota company is the successor of the La Crosse (Wis.) Gas & Electric Company. It has further acquired all the properties of the Chippewa Valley Railway, Light & Power Company and the Chippewa Valley Construction Company. There was issued for the acquisition of the new properties and for the retirement of the outstanding bonds of the La Crosse Gas & Electric Company and the Chippewa Valley Railway, Light & Power Company $3,750,000 of bonds, $1,500,000 of 7 per cent preferred stock and $538,000 of common stock. The American Public Utilities Company retained the common stock. The increase in earnings of the Chippewa Valley Railway, Light & Power Company has been very rapid during the last five years, the gain in earnings from 1905 to 1912 being 367 per cent. On the Chippewa River there are three water-power sites, with an aggregate head of 132 ft., said to be capable of producing 85,000 electrical hp. It is stated that these sources of energy are only 90 miles from St. Paul and Minneapolis. On the Menomonie River, 65 miles from St. Paul, the company owns three water-power sites with an aggregate head of 102 ft., said to be capable of developing 30,000 electrical hp. The directors of the American Public Utilities Company say: "The importance of this water-power, the only large undeveloped power within equal transmission distance from the Twin Cities, can hardly be overestimated." The Railroad Commission of Wisconsin has approved the organization of the Wisconsin-Minnesota Light & Power Company and has agreed to issue additional securities as water-powers at present undeveloped are utilized.

NEW YORK METAL MARKET PRICES

	Sept. 16	Sept. 22
Copper:		
Prime Lake	12.40 to 12.60†	12.25 to 12.37½†
Electrolytic	12.10 to 12.20†	11.87½ to 12.00†
Casting	12.00 to 12.10†	11.75 to 11.87½†
Copper wire base	13.50 to 13.75	13.25 to 13.50
Lead	3.90	3.90
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50	8.50
Spelter, spot	5.40 to 5.50	5.25 to 5.35
Aluminum, 98 to 99 per cent	19.00 to 19.50	18.50 to 19.00

COPPER EXPORTS

Total tons to Sept. 22 11,897

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

Corporate and Financial

Washington Water Power Company's Dividend.—The Washington Water Power Company, Spokane, Wash., declared a quarterly dividend of 1¾ per cent, payable on Oct. 1. This is a reduction of 25 cents a share, making a total of 7¾ per cent in dividends for 1914.

Deferred Action on Common Dividend.—The United Light & Railways Company, Grand Rapids, Mich., has deferred action on the common dividend indefinitely on account of unsettled conditions. Mr. Frank T. Hulswit, president of the company, stated in respect to the dividend: "We have earned sufficient to pay it and we have the cash, but prefer to take the conservative course now and cannot say when the next common dividend will be declared."

Electric Utilities Declare Regular Preferred Dividends.—The following companies have declared their regular quarterly dividends on preferred stock, payable on Oct. 1: The United Light & Railways Company, Grand Rapids, Mich.; the Asheville (N. C.) Power & Light Company, the Carolina Power & Light Company, Raleigh, N. C., and the Eastern Michigan Edison Company, Detroit, Mich. The Detroit (Mich.) Edison Company has declared the regular quarterly dividend, payable on Oct. 15.

Peruvian Company's Income.—The income of the Lima (Peru) Light, Power & Tramways Company, known in Peru as the Empresas Electricas Asociadas, for 1913, amounted to $1,974,844, being an increase of $165,002 over 1912 as compared with the $5,404 excess of 1912 over 1911. Operating expenses and other charges amounted to $1,056,665 in 1913 and $981,105 in 1912. Thus the net profit in 1913 was $918,179, as against $823,737 in 1912. The increase in gross profits from the electrical service department for 1913 amounted to $28,118, while the operating costs were $2,127 less in 1913 than in 1912. The decrease in operating expenses was attributable to a smaller fuel oil consumption owing to the increased power secured from the River Rimac and the advantageous operation of the high-tension lines between Chosica and Lima. The company has recently been reorganized with Dr. Prado y Ugarteche as general manager and practically has a monopoly in Lima, Callao and suburban towns.

Monterey Railway, Light & Power Company.—The annual statement of the Monterey Railway, Light & Power Company, Monterey, Mexico, covering as it does the time that it was in the midst of the Mexican war, is of great interest. Net earnings for 1913 amounted to $444,251. After meeting fixed charges and interest and providing for a 5 per cent dividend of preferred stock there remained a balance of $127,251, thus increasing the surplus to $601,098. From this was taken $150,000 and placed to reserve for contingencies, making that fund $450,000 and leaving a credit to profit and loss of $451,098. The directors consider the fact that, apart from the question of exchange, the interest on the outstanding debenture stock was earned exceedingly satisfactory. It was stated that the year promised to show a large increase over 1912, many large contracts having been signed. However, the disturbance in commercial affairs overcame all of this. During the period of hostilities operation of the plant was not discontinued.

Idaho-Oregon Light & Power Company.—In regard to the plan of the bondholders of the Idaho-Oregon Light & Power Company, of Boise, Idaho, to bid in the property at the sale Sept. 30, as noted in our issue of Sept. 12, Mr. W. J. Ferris, receiver for the company, has made the following statement: "The court's decision removes all question as to the stability of the Idaho-Oregon company. Another factor that will add to the strength of its position is the completion of the Oxbow power plant. It will be in operation for some time prior to the sale. This means that when the bondholders bid on the property they will be bidding on a concern fully equipped to render the service required of it. At present the company is buying during the irrigation season 3000 hp. With the completion of the Oxbow plant it will have a surplus of 2000 hp, since the Oxbow plant will develop 5000 hp. Thus the company is able to cover its field, and with Judge Dietrich's decision on the disputed bonds the way is cleared for the Idaho-Oregon company's bondholders to bid in the property and protect their investment."

English Company Defers Interest.—The Alabama Traction, Light & Power Company deferred the interest due on Sept. 1 on its $10,914,400 first-mortgage 5 per cent fifty-year bonds. The company now has its hydroelectric plant in operation, and the board of directors feels confident the motor-service contracts now on hand and the other utilities' earnings will be sufficient to cover bond interest and operating expenses. However, additional capital must be expended on the distribution circuits before several of these contracts will become productive. The board considers that it has resources enough for that expenditure and that they should be reserved for that purpose. The board feels warranted in assuring bondholders that the condition is but temporary and that it is justified in conserving all its cash resources in such abnormal times. The bondholders will be notified, as soon as the situation permits, of definite plans for the payment of the deferred interest.

Electric Utility Bonds and Notes.—A compilation published in the *Wall Street Journal* shows that by the end of 1915 $48,878,000 in notes and bonds of electric utility companies will have matured. Of this amount $6,270,000 mature in 1914 and $42,608,000 mature in 1915. The largest issue maturing this year is the 6 per cent note issue of the United Light & Power Company of New Jersey for $2,150,000, due Dec. 1. During 1915 the large issues maturing are the Pacific Gas & Electric Company's 5 per cent collateral trust notes amounting to $7,000,000, due March 25; the United Gas & Electric Company's 5 per cent notes amounting to $6,264,000, due April 1; the Portland Railway, Light & Power Company's 5 per cent notes amounting to $5,000,000, due May 1, and the Pacific Light & Power 5 per cent collaterals amounting to $6,238,000, due July 1. The smallest issue is for $220,000, being the United Light & Railways 6 per cent notes due Jan. 1.

Public Service Corporation of New Jersey.—At the last meeting of the board of directors of the Public Service Corporation of New Jersey, at which the regular dividend was declared, Mr. Thomas N. McCarter, president of the company, took occasion to refer to what he considered the excellent condition of the company in view of existing general business conditions. He pointed out that while a number of steam railroads and utility companies were showing decreases in gross earnings, the Public Service properties for eight months in the year showed actual increases which, though not so large as normal annual gains, were very gratifying as compared with the statements of similar properties. Taking the records of this year and recalling the conditions which existed during the period of depression in 1907, when the company's business stood up in a gratifying manner, Mr. McCarter expressed the opinion that these facts could be taken as an evidence of the inherent strength of the property and an indication that its securities will appeal with greater force to the investing public when business conditions can reach a normal state.

Utah Securities Corporation Buys Property.—The Utah Securities Corporation, a holding company controlled by the Electric Bond & Share Company, has acquired from the Oregon Short Line Railroad 98 per cent of the capital stock of the Utah Light & Railway Company, of Salt Lake City. The other 2 per cent is held elsewhere, and the Utah Securities Corporation is seeking to acquire the remainder on the terms accepted by the Oregon Short Line. The securities company also owns the Utah Light & Power Company, of Salt Lake City. Pending the decision of the city on franchise consolidation the two companies are to be kept entirely separate, however. The two companies do not compete in Salt Lake City. The Utah Power & Light Company has never pushed its franchise privileges in that city. In Ogden, Utah, however, the two companies will continue to compete until a consolidation is effected. The new company which has been organized to take over the Utah Light & Railway is called the Salt Lake Light & Traction Company. Should Salt Lake City permit the consolidation of the franchises of the two companies, they will then probably be consolidated in one company of two departments—the light and power department and the railway department. The properties as acquired in Ogden from the Oregon Short Line were in excellent condition with the exception of the gas department, which had not been developed as well as the other departments.

EASTERN COMPANIES' GOOD SHOWING

July Returns from Central-Station Companies Operating in Atlantic States Best for Half-Year Period

In reviewing the returns received by the *Electrical World* from the electric utility companies operating in the Atlantic States over a six-month period, July is seen to have been the best month for central stations in that region. Although May showed up exceedingly well in income increase—in fact, better than did July—a glance at Table II will reveal this to be due entirely to the activity of three large companies in New York, New Jersey and Pennsylvania. The rest of the industry for May, while showing good increases, was not in such a prosperous state as it was in July. Also, during July the separate companies seemed each to be growing at the same rate, namely, about 12 per cent.

During June the Middle Atlantic companies were not growing nearly so fast as the South Atlantic companies. Their actual growth in income and output, to be sure, was larger, but their percentage rate of growth was smaller. In July the Middle Atlantic companies improved and almost tripled their growth rate, thereby bringing the two sections of the Atlantic States more nearly into unison.

The figures found in Table I are not comparable. They represent all the returns received by the *Electrical World*, starting with the month of February. However, they do for the most part represent the same companies. The great

TABLE I—RETURNS RECEIVED FROM CENTRAL STATIONS IN ATLANTIC STATES OVER A HALF-YEAR PERIOD

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
July (70 per cent of industry)	$6,179,186	$5,483,319	12.7	264,856,199	236,068,939	12.2
June (70 per cent of industry)	6,067,780	5,728,381	6.0	244,936,886	221,315,464	10.8
May (68 per cent of industry)	6,492,767	5,628,718	14.5	259,098,542	238,733,320	8.4
April (65 per cent of industry)	6,731,495	6,106,634	10.3	261,133,882	252,069,127	3.7
March (60 per cent of industry)	6,021,269	5,661,027	6.4	246,306,123	223,156,161	10.5
February (54 per cent of industry)	7,288,792	6,655,011	9.8	231,790,165	205,726,060	12.6

difference is in the smaller companies. Even were the differences greater than they are, one would hardly expect such an enormous month-to-month difference in growth. This is due entirely to the activities of the larger companies in the Middle Atlantic States. Table II shows a jump from 7.6 per cent growth in income in April to 28.2 per cent in May, and then back again to 3.7 per cent in June, only to jump to 10.8 per cent in July. On the output side the differences are by no means so pronounced, the greatest jump being from 5.7 per cent in June to 9.5 per cent in July.

Tables II and III offer an opportunity for comparing the Middle Atlantic with the South Atlantic States. Each table represents the operations of the three largest companies in that region from which the *Electrical World* is receiving returns. Moreover, no two companies are in the same state. In that way we are able to show a state of affairs representing conditions in the large cities of the Atlantic group. Previous to July the South Atlantic companies had been showing a decreasing growth in output. On the income side the growth has varied from 10.2 per cent in May to 12.8 per cent in July. The differences, however, are not startling and show a gratifying condition. With an output growth of over 25 per cent maintained for five months and

an income growth of over 10 per cent maintained for that period, the central-station industry of the South Atlantic States appears to be flourishing.

As noted above, the data for the large companies in the Middle Atlantic region show a fluctuating character—the fluctuations being always on the side of growth and expansion. While the income increase did get as low as 3.1 per cent in March, it got as high as 28.2 per cent in May. For the six months from February to July inclusive these three companies' income from the sale of energy was $19,755,605

TABLE II—OPERATIONS OVER A HALF-YEAR PERIOD OF THREE LARGE COMPANIES IN MIDDLE ATLANTIC STATES REPRESENTING 35 PER CENT OF THE CENTRAL-STATION OUTPUT OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
July	$2,933,019	$2,648,625	10.8	106,607,151	97,459,526	9.5
June	2,952,454	2,844,643	3.7	103,013,271	97,628,941	5.7
May	3,173,526	2,476,781	28.2	108,171,896	104,267,718	3.8
April	3,437,634	3,194,160	7.6	112,894,803	105,328,705	7.2
March	3,492,149	3,386,190	3.1	118,897,901	114,136,574	4.2
February	3,766,823	3,497,948	7.8	112,892,266	108,302,262	4.2

for 1914, as compared with $18,048,347 for 1913, or an increase of 9.7 per cent. For the five-month period from March to July inclusive the South Atlantic companies, as shown in Table II, gave an income increase of 11.4 per cent. Thus it is seen that over a long period the two sections of the Atlantic region were growing at approximately the same rate. It must not be forgotten, however, that a 1 per cent growth in the Middle Atlantic States means a much larger gross increase than a similar percentage in the Southern States.

No tables were made out for the small companies in this region since they told practically the same story as the large companies. The larger companies predominate in

TABLE III—OPERATIONS OVER A FIVE-MONTH PERIOD OF THREE LARGE COMPANIES IN THE SOUTH ATLANTIC STATES REPRESENTING OVER 50 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THAT REGION

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
July	$551,631	$488,982	12.8	43,345,399	35,247,104	27.8
June	552,289	496,641	11.4	43,452,961	34,743,542	25.1
May	574,160	520,981	10.2	43,967,670	34,547,286	27.0
April	604,065	537,670	12.3	44,545,161	34,308,432	29.9
March	642,658	579,850	10.9	45,860,568	34,912,792	31.4

this group, and what are here small companies in other regions would be large companies.

July marks the beginning of the upward trend of the load curve. The decreasing length of the days means a greater energy consumption for lighting. The heat of midsummer brings with it an increasing demand for electrical appliances. The electric fan takes an appreciable amount of energy. The electric flatiron replaces the old irons heated by the coal range. Other small appliances, such as the toaster, the egg cooker, small hot-plates, etc., are used to diminish the discomforts of summer. The vacuum cleaners, dish washers, washing machines and large electric stoves become very popular in the summer months. These for the most part consume energy at lighting rates. These facts mean a much greater percentage increase in income compared with previous months than would be shown on the output side.

Business Notes

Walter B. Snow, publicity engineer, has changed his address from 170 Summer Street to 136 Federal Street, Boston, Mass.

The **Titan Storage Battery Company**, of Newark, N. J., has opened a Chicago office at 2332 Michigan Avenue. D. M. Simpson, an experienced engineer, is in charge.

The Philadelphia Electrical & Manufacturing Company, Philadelphia, Pa., has appointed L. F. Johnston, formerly with the Lewis-Roth Company and the Richmond Motor Company, as special sales representative in Philadelphia and New York City.

New Industrial Companies

The Western Utilities Company, Milwaukee, Wis., has been incorporated to manufacture electric motors. The capital stock is $25,000. The incorporators are C. M. Sandon, E. E. Hill and F. A. Johnson.

The Kirkman Engineering Corporation has been incorporated to deal in machinery and electrical devices. The capital stock is $25,000 and the incorporators are T. W. Kirkman, G. Whittlesey and R. P. Hart, 130 East Sixty-seventh Street, New York.

The Hallbauer, Hardman Manufacturing Company, of Schenectady, N. Y., has been incorporated to manufacture lamps. The capital stock is $10,000, and the incorporators are A. F. Hallbauer, 337 State Street, Schenectady, and Thomas Hardman and A. B. Van Vost, also of Schenectady.

Trade Publications

Electric Products.—An attractive 208-page catalog and handbook has been published by W. N. Mathews & Brother, Inc., St. Louis, Mo.

Mechanical Stoker.—Automatic mechanical stokers are the subject of a catalog put out by the Wetzel Mechanical Stoker Company, Trenton, N. J.

Portable Electric Bench Drills.—The Electric Star Devices Company, Pittsfield, Mass., has issued a leaflet describing its portable electric bench drills.

Electric Wiring Devices.—Pass & Seymour, Inc., Solvay, N. Y., have published a small vest-pocket-size catalog which is a photographic reproduction of their Catalog No. 9.

Armored Cable.—The Trumbull Electric Manufacturing Company, Plainville, Conn., has issued a leaflet containing a price list of its armored cable and flexible steel conduit.

Centrifugal Pumps.—Various types of steam and electric centrifugal pumps are described and illustrated in Catalog No. 132 issued by the American Well Works, Aurora, Ill.

Oil Engines.—Bulletin No. 34-W, issued by the Chicago Pneumatic Tool Company, Chicago, Ill., contains information on and illustrations of an oil engine operating with low-grade fuel.

Hospital Signal System.—A lamp signal system for hospitals is described in an attractively illustrated thirty-two-page catalog recently issued by the Bryant Electric Company, Bridgeport, Conn.

Direct-Current Meters.—A direct-current instrument of the moving-coil type is described in a circular issued by the Record Electrical Company, Ltd., Caxton House, Westminster, S. W., London, England.

Residential Telephone System.—A folder entitled "Home Talk" describes a telephone system for use in various parts of one building. This folder has been published by the Western Electric Company, New York.

Large Stock of Tools.—A leaflet has been published by the Smith & Hemenway Company, 150 Chambers Street, New York, announcing that a large stock of tools is being kept on hand in anticipation of heavy buying this fall.

Steam Engines and Boilers.—Steam boilers are the subject of Bulletin No. 127, long-stroke throttling engines of Bulletin No. E126, and steam engines for direct connection to electric generators of Bulletin No. 128, issued by the Chandler & Taylor Company, Indianapolis, Ind.

Personal Mention

Mr. K. E. Norton has succeeded Mr. W. F. Frederick as superintendent of the electric light and water plant at Coldwater, Mich.

Mr. W. H. Fellows, manager of the Leavenworth (Kan.) Light, Heat & Power Company, has tendered his resignation, effective Oct. 1.

Mr. Charles W. Amidon has been appointed district superintendent for the Central Illinois Public Service Company, with headquarters at Macomb, Ill.

Mr. F. S. Armstrong, of Macomb, Ill., has resigned his position of district superintendent for the Central Illinois Public Service Company, effective Oct. 1.

Mr. Archibald R. Gibbons, formerly advertising manager for the Federal Sign System (Electric), has resigned to associate himself with the Curtis-Johnson Printing Company, of Chicago.

Mr. D. M. Simpson is in charge of the recently opened office of the Titan Storage Battery Company in Chicago. Mr. Simpson was formerly engineer for the Electric Storage Battery Company.

Mr. A. B. Marsden resigned as manager of the Manchester (Vt.) Light & Power Company Sept. 1, after an association with the company extending over ten years. Mr. Marsden will enter the electrical business in Manchester.

Mr. Hogan Burud has been appointed manager of the Big Falls (Minn.) Manufacturing Company, superseding Messrs. A. L. Shipley and William Beard, who formerly held, respectively, the positions of manager and superintendent.

Mr. Charles W. Jordan, superintendent of the La Porte (Tex.) Water, Light & Ice Company, has succeeded Mr. T. V. Buckholz as vice-president of the company. Mr. Jordan's former title of secretary-treasurer is now held by Mr. M. B. McNitt.

Mr. Robert S. Orr, general manager of the Duquesne Light Company, Pittsburgh, Pa., recently suffered a bereavement in the death of his wife, Mrs. Beryl R. Orr. Mr. Orr is one of the best known central-station men in the State of Pennsylvania, and his loss will be learned of with regret by his many friends.

Mr. D. W. Low, former general manager of the Michigan Power Company, Lansing, Mich., is now directing the Berrendo irrigated farms development near Roswell, N. M. His company is developing a large tract and has taken over the Roswell Gas & Electric Company in order to obtain the necessary power for the irrigation project.

Mr. H. J. Hoover, who has been head of the gas commercial department of the Union Gas & Electric Company, Cincinnati, Ohio, for some time, has been placed in charge of the combined electric and gas commercial departments since the resignation of Mr. Parker H. Kemble, formerly manager of the electric commercial department.

Mr. Fletcher Easton, who has been manager of the Selma (Cal.) district of the San Joaquin Light & Power Corporation for some time, has assumed charge of the San Luis Obispo and Santa Maria districts of the Midland Counties Public Service Corporation, superseding Messrs. George L. Howard and A. M. Frost. Mr. Frost will become manager at Selma.

Mr. F. I. Woltz has resigned as commercial engineer of the Great Shoshone & Twin Falls Water Power Company, Twin Falls, Idaho, to fill a similar position with the Union Gas & Electric Company, Cincinnati, Ohio. He is a graduate of Pennsylvania State College and an associate member of the A. I. E. E. and a member of the Idaho Society of Engineers.

Mr. Truman P. Gaylord, retiring district manager of the Chicago office of the Westinghouse Electric & Manufacturing Company, was a guest at a dinner given in his honor at the Midday Club, Chicago, on Sept. 18. The hosts were the men in the Chicago and branch offices, who presented to Mr. Gaylord a gold watch, with a chain and gold pocketknife attached.

Mr. Bion J. Arnold returned home on Sept. 17 after a summer in Europe. With other Chicagoans Mr. Arnold went abroad to study railroad terminal facilities, electrolysis and other subjects. The war of the Old World interfered to some extent with the objects of the visit, but after the other commissioners had departed Mr. Arnold continued investigations on his own account, and, with Mrs. Arnold, visited friends in England. He and his wife were entertained by Col. R. E. Crompton, Dr. R. T. Glazebrook and others.

Mr. Fred B. Corey, who for the past three years has been engineer of inspection and tests of the Union Switch & Signal Company, Swissvale, Pa., has resigned that position and opened a consulting engineering office at 404 Arrott Building, Pittsburgh, Pa. Mr. Corey was for eleven years in the engineering department of the General Electric Company. In his new work Mr. Corey will make a specialty of inspection methods and organizations for manufacturing companies and will also give attention to electric-railway signaling and allied subjects.

Mr. Henry W. Young, until recently editor of *Popular Electricity* (now merged in *Modern Electrics*), has opened an office with Mr. C. E. Young in the First National Bank Building, Chicago, as a technical advertising writer and counselor. Mr. Young is a graduate of the electrical engineering course of the University of Wisconsin. He has been employed by the Western Electric Company, was at one time a member of the editorial staff of the old *Western Electrician*, and for a year and a half was connected with the advertising department of the Ohio Brass Company. Mr. Young is a member of the Jovian Order, the Electric Club of Chicago and other electrical societies.

Mr. Charles E. Young, formerly a director and advertising manager of the Ohio Brass Company, of Mansfield, Ohio, has resigned and has opened an office with Mr. H. W. Young in the First National Bank Building, Chicago, to give technical advertising service. Mr. Young was a member of the class of 1901 of Washington and Jefferson College. After leaving college he was employed first in the advertising department of the Western Electric Company and later in a similar capacity by Porter & Berg (Electric Service Supplies Company). For the last ten years he has been in charge of the advertising department of the Ohio Brass Company, where his work has attracted attention.

Mr. Louis Cohen has engaged in the practice of consulting and research engineering at 1855 Calvert Street, Washington, D. C., and will give his entire time to the mathematical aspects of the subject. Mr. Cohen is a graduate of Armour Institute, and studied mathematics, physics and advanced electrical engineering in the University of Chicago and Columbia University, completing work for a Ph.D. degree in 1905. From 1905 to 1909 he was on the scientific staff of the Bureau of Standards, and he also served as assistant professor of the George Washington University from 1907 to 1909. He was chief of the research department of the National Electric Signaling Company from 1909 to 1912, since which time he has made independent investigations in high-frequency alternating currents. He is the author of "Formulæ and Tables for the Calculations of Alternating-Current Problems" and a number of scientific and technical papers.

Obituary

Edward J. Hall, vice-president of the American Telephone & Telegraph Company and a pioneer in long-distance telephony, died at Watkins, N. Y., Sept. 17. Mr. Hall was born in Perth Amboy, N. J., March 31, 1853. When in 1877 the parent company of the Bell system was organized he secured the right to operate under the Bell patents in Buffalo. At the request of Mr. T. N. Vail, Mr. Hall took charge of the development of long-distance telephony on Jan. 1, 1885. Mr. Hall was a director in the New York Telephone Company, the Western Union Telegraph Company, in which he was also chairman of the executive committee; the Cumberland Telephone & Telegraph Company, the Southern Bell Company, and the Market & Fulton National Bank of New York.

Construction

New England

MECHANIC FALLS, MAINE.—The Mechanic Falls El. Lt. Co. expects to make a number of extensions to its plants, including a new penstock. A. C. Barker is superintendent of the plant.

CAMBRIDGE, VT.—A survey is being made of the water-power on the property of R. P. Redmond, of this town. Mr. Redmond plans to develop the water-power and furnish electricity for the villages of Jeffersonville, Cambridge, Underhill and Jericho.

GARDNER, MASS.—Within the next two months the Gardner El. Lt. Co. expects to purchase eighteen ornamental lighting standards. J. D. Whittemore is manager of the company.

GREAT BARRINGTON, MASS.—Within the next six months the Great Barrington El. Lt. Co. expects to purchase wire, meters, transformers and lightning arresters. H. Clyde Parrish is superintendent of the plant.

MELROSE, MASS.—The inauguration of the new "white way" in this city recently was made the occasion of an imposing celebration.

NORTH ATTLEBORO, MASS.—A new 250-hp Heine water-tube boiler is shortly to be installed in the municipal lighting plant here. Within the next three months 200 street-lighting fixtures of the pole-bracket type will be purchased for the plant, of which William Plattner is superintendent and manager.

NORTHAMPTON, MASS. — The city lighting committee has under consideration the changing of the street-lighting system on Main Street from arc lamps to nitrogen-filled lamps, it is said. The proposed installation would give 20,000 cp as compared with 8320 cp from the present arc system, and at a reduced cost.

WESTFIELD, MASS.—A 600-kw Curtis turbo-generator, a Heine boiler and an Alberger condenser have recently been installed in the plant of the Westfield Gas & El. Lt. Wks. T. T. Logie is manager.

DANBURY, CONN.—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p. m. Nov. 4, for the construction complete (including mechanical equipment, interior lighting fixtures and approaches) of the United States post office at Danbury. Drawings and specifications may be had after Sept. 30 from the custodian of the site or from O. Wenderoth, supervising architect, Treasury Department, Washington, D. C.

Middle Atlantic

AUBURN, N. Y.—The Empire Gas & El. Co., of this city, is engaged in preparing uniform specifications for all the material used in its various plants. These specifications will be sent to the company's superintendents, and in the future all material ordered for construction and maintenance will be uniform. L. C. Reynolds, Auburn, N. Y., general superintendent, is directing this work. C. H. Pierce is purchasing agent.

NIAGARA FALLS, N. Y.—A decorative lighting system from Falls Street along Third to Main and along Main to connect with the North Main Street system at Michigan Avenue is under discussion. The Mayor has had a conference with the Niagara Falls El. Lt. & Pwr. Co. regarding this ornamental system, which will cost about $20,000, it is said. The expense of the installation will be divided between the property owners and the city. J. E. Montague is general manager of the lighting company.

UTICA, N. Y.—Proctor Boulevard, a newly developed section near Utica, has installed a modern lighting system. All the wires are underground, and the posts, which are of classic design, are equipped with 300-cp tungsten lamps with large globes. The system is exceptionally complete and artistic for a new section.

AMBRIDGE, PA.—With the expiration of the present street-lighting contract this month it is proposed to change a number of the arc lamps to 400-cp tungsten-filament lamps, at a cost of $55 per annum. The Interboro El. Co., which is controlled by the West Penn Tract. Co., operates in Amridge.

CARLISLE, PA.—The bungalow colony at Bellaire Park has planned many improvements, the principal one being an electric-lighting system throughout the entire park. The installation will include sufficient illumination to make night bathing possible. J. P. Culbertson is manager.

DILLSBURG, PA.—The Dillsburg Lt., Ht. & Pwr. Co. has been awarded a contract to furnish street lighting. Arc lamps will continue to be used.

HIGH SPIRE, PA.—The lighting system to be installed in this town, mentioned Sept. 15, will require 80 wooden posts, with incandescent lamps ranging from 45 cp to 100 cp. Energy will be furnished by the Harrisburg (Pa.) Lt. & Pwr. Co. For further information address the secretary of the borough, S. A. Book.

KITTANNING, PA.—It is reported that plans are being prepared by A. M. Morgan, 111 West Monroe Street, Chicago, Ill., for an electric-light plant and water-works, to cost $125,000.

MAUCH CHUNK, PA.—It is reported that the Mauch Chunk Ht., Pwr. & El. Lt. Co. has purchased a plot from the Wentz estate upon which it is planned to build a substation. Steel towers will be erected from the substation of the Lehigh Navigation El. Co., from which the Mauch Chunk company purchases its energy.

NEW CASTLE, PA.—The contract for installing a street-lighting system here has been awarded to the Western El. Co. of Pittsburgh, it is said, for the sum of $8,690. Electric lamps will be placed along Washington Street from County Line Street to Greenwood Avenue.

PITTSBURGH, PA.—Sealed proposals for furnishing and installing an electric-light plant at Lock 4, Monongahela River, will be received at the United States Engineer's office, Pittsburgh, Pa., until Oct. 15. For further information address Francis R. Shunk, Lieut-Col. of Engineers, Pittsburgh, Pa.

PITTSBURGH, PA.—A lighting system is being installed in Frankstown Avenue, between Penn and Lincoln Avenues, following much agitation by the property owners in that district, directed by P. J. Walsh, a realty broker and East End property holder. Forty-four lamps are to be attached to trolley poles along each side of the street. The prospective "white way" of East Liberty is being received with much enthusiasm by the residents.

BAYONNE, N. J.—The Board of Education will receive bids up to Oct. 1 for electric and gas fixtures for Public School No. 2. Plans and specifications are at the office of Guilbert & Betelle, 665 Broad Street, Newark, N. J.

CHATHAM, N. J.—The Commonwealth Wtr. & Lt. Co. has applied to the Chatham Township Committee for a 50-year electric light and power franchise for private, commercial and municipal service throughout the township.

PERTH AMBOY, N. J.—At the general election Nov. 3 the proposal to erect a municipal plant will be submitted to the voters, and also the matter of issuing bonds to the amount of $120,000 for the construction of such a plant.

TRENTON, N. J.—Charles F. Stout and other members of the Chamber of Commerce are agitating the subject of improved street lighting along State and Broad Streets.

KENOVA, W. VA.—The Consolidated Lt., Ht. & Pwr. Co. expects to install within the next three months three 500-hp B. & W. boilers. The equipment has already been purchased. W. W. Magoon is general manager and W. R. Power is superintendent.

KIMBALL, W. VA.—The Kimball Lt. & Wtr. Co., it is said, will petition the City Council for a franchise to construct and operate an electric-light plant and water-works.

WHEELING, W. VA.—A transmission line from Woodsdale to Elm Grove will be erected by the Wheeling Valley Lt. & Pwr. Co. within the next three months. G. W. Davis is superintendent of the plant.

North Central

COLDWATER, MICH.—Within the next six weeks an additional 15-kw regulator will be installed in the municipal electric light and water plant. The street-lighting system in which arc lamps have been used will be changed to 600-cp incandescent lamps. The installation of additional street lighting on 1400 ft. of roadway is under consideration. K. E. Norton is superintendent of the plant.

FENTON, MICH.—The plans for the ornamental lighting system mentioned Sept. 19 call for the multiple single-unit system. From 25 to 30 posts will be required, 100-cp incandescent lamps will be used and three-wire system, underground construction, will be employed. The contract for this installation has not yet been placed. Joseph Mount is chairman of the lighting committee, and Ross McCurdy is city clerk.

GREENVILLE, MICH.—The R. J. Tower El. Co. has recently completed rebuilding its plant. S. L. Tower is manager.

LANSING, MICH.—The Board of Light and Water Commissioners has entered into a contract with the Western El. Co. of Chicago for all the electrical appliances the city will require for a year.

SAGINAW, MICH.—No action has as yet been taken by the City Council relative to the erection and maintenance of an electric light and power plant. H. S. Gay is city clerk.

ST. CLAIR, MICH.—At St. Clair there will be installed some additional ornamental street-lighting equipment, probably 12 five-lamp clusters similar to those already installed in the park. W. M. Barron is superintendent of the St. Clair electric-light plant and water-works.

BELLAIRE, OHIO.—The Wheeling Trac. Co. has agreed to extend its lines from Barton to St. Clairville within the next eighteen months.

CINCINNATI, OHIO.—The building at 612-614 Race Street, seven stories in height, will be remodeled by Charles F. Dickson, for the Arnoldt Doll Co., and an electric elevator will be installed.

DAYTON, OHIO.—The City Council has given favorable attention to the complaint of the citizens in Vernon Place (a suburb of Dayton) for improved lighting service.

IRONTON, OHIO.—It is reported that the Tri-State El. Laundry Co. will build a modern laundry in Ironton, the machinery for which will be motor-driven. Sam Brewster and others are interested.

BOWLING GREEN, KY.—The Kentucky Pub. Serv. Co. expects to purchase within the next twelve months transformers of various sizes to the extent of $4,500, meters to the extent of $5,000, and miscellaneous material approximating $10,000. H. D. Fitch is manager of the company.

CARLISLE, KY.—A new franchise is being drafted for the Carlisle El. Lt. & Pwr. Co. An improved system of lighting is planned for Carlisle, and the lighting company will add an ice plant.

HAZEL, KY.—Machinery for the electric-light plant, the franchise for which was recently purchased by Claude Orr and A. E. Roane, has been purchased and will be installed as soon as the new structure is completed.

MUNFORDVILLE, KY.—It is reported that the Munfordville El. Lt. & Pwr. Co. has been taken over by the New El. Lt. & Pwr. Co.

NEWPORT, KY.—The Bell Tel. Co. has made application to the Fiscal Court for a franchise permitting the extension of its lines to every part of the county. The franchise will probably be granted if suitable arrangements regarding rates can be made.

CLINTON, IND.—The Clinton El. Lt. & Pwr. Co. is installing at the present time a 500-kw turbine generator and auxiliaries. C. M. Poor is superintendent of the plant.

EVANSVILLE, IND.—A ten-year contract at $50,000 a year for lighting the streets of Evansville has recently been awarded by the City Council to the Evansville Pub. Serv. Co.

FORT WAYNE, IND.—It is reported that George Smith, for ten years proprietor of the boat line running on Tippecanoe Lake, is purchasing machinery to equip a plant to supply energy to the cottages on the south side of the resort for electric lighting next year.

FOWLER, IND.—The new street-lighting system will be placed in operation Oct. 1.

GAS CITY, IND.—In the municipal lighting plant within the next month there will be installed a 72-in. by 18-in. horizontal return tubular boiler. Within the next six months it is planned to purchase an engine-connected alternating-current generating unit of about 100 kw, 2400 volts, 60 cycles, three-phase. T. S. McKee is superintendent of the plant.

GOSHEN, IND.—The City Council at a recent meeting made an appropriation of $5,000 toward improvements in the municipal lighting plant.

HUNTINGTON, IND.—Contracts amounting to $36,615.72 have been closed for the erection of a municipal lighting plant at Huntington. This sum does not include the piping, foundation work and wire extensions. A $50,000 bond issue has been made, which, it is estimated, will provide for this installation.

WALKERTON, IND.—The municipal electric-lighting plant has been discontinued and energy for this city is being purchased from the Plymouth (Ind.) El. Lt. & Pwr. Co. A. L. Freyer is superintendent of the electric-light department at Walkerton.

NEWTON, ILL.—Within the next two months there will be purchased for the municipal electric-light plant a 150-hp tubular boiler. John W. Mathery is city clerk at Newton.

PRAIRIE DU ROCHER, ILL.—The contract for the erection of an electric-light plant and water-works (mentioned Aug. 22) has, it is said, been awarded to Monie & Dunbar at $18,324.

PRINCETON, ILL.—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p. m. Nov. 5, for the construction complete (including mechanical equipment, interior lighting fixtures and approaches) of the United States post office at Princeton. Drawings and specifications may be obtained after Sept. 30 from the custodian of the site or from O. Wenderoth, supervising architect, Treasury Department, Washington, D. C.

WATAGA, ILL.—At the Wataga mill and lighting plant a new switchboard will be erected within the next month. A garage has been added to the plant. H. J. Kunkle is president and manager of the plant.

BERLIN, WIS.—The Berlin Public Service Co. has been empowered to issue $10,500 in bonds for the purpose of redeeming certain outstanding notes.

GREEN BAY, WIS.—Work is progressing rapidly on the new transmission line between Wrightstown and Brillion, which is being erected by the Wisconsin Pub. Serv. Co.

MADISON, WIS.—The Southern Wisconsin Ry. Co. has received authorization to issue $20,000 in bonds in order to carry out the recent decision of the Railroad Commission ordering the company to double-track a portion of its street-railway system in Madison.

MOUNT HOREB, WIS.—Within the next two months the Mount Horeb Ht., Lt. & Pwr. Co. expects to erect 26 miles of 13,200-volt, three-phase, 60-cycle transmission line to furnish energy to Mazomanie, Black Earth, Mount Horeb and possibly other towns, and to give service to farmers along the route. Poles, insulators, wire, step-up and step-down transformers, lightning arresters and other material necessary for the building of the extension will be purchased. M. C. Mathison is president of the company.

NEW LONDON, WIS.—Within the next thirty days several improvements will be made to the municipal electric-light and water-works plant. A change will be made from single-phase to three-phase, and a new pumping station will be installed. Two 40-hp motors and the necessary switchboard equipment have been purchased. O. H. Pribnow is superintendent.

RIB LAKE, WIS.—A new engine will be purchased within the next year for the municipal electric-light plant. J. Steffeck is village clerk.

WAUPACA, WIS.—The Waupaca El. Lt. & Ry. Co. recently installed a street-lighting system for the city of Waupaca, consisting of 20-in. concentric Holophane-D'Olier reflectors with Holophane refractors and equipped with 400-cp, 6.6-amp series nitrogen-filled lamps. These lamps replaced 6.6 amp inclosed series arc lamps. Irving P. Lord is president and general manager.

WEYAUWEGA, WIS.—The Weyauwega El. Lt. Co. has been authorized to issue $10,000 in stock and $40,000 in 6 per cent bonds for the purpose of acquiring a dam and power site with the necessary water rights, station equipment, etc.

WITTENBERG, WIS.—The Wittenberg El. Co. has just installed a Leffel waterwheel and expects to purchase a waterwheel governor for same some time next spring. Edmond L. Debot is president and treasurer of the company.

ELBOW LAKE, MINN.—The municipal electric-light plant of Elbow Lake has been sold to the Otter Tail Pwr. Co., Fergus Falls, Minn.

HENDRICKS, MINN.—The Hendricks Lt. & Pwr. Co. expects to purchase within the next two months an oil or gas engine to replace steam equipment.

KENYON, MINN.—The Gunderson Milling Co. (formerly the Kenyon Flouring Mills & El. Lt. & Pwr. Co.) expects to purchase shortly one 100-kva, 2300-volt, 720-r.p.m., three-phase, 60-cycle synchronous motor complete with exciter, starting autotransformer, oil switches, control panel, etc., and about 100-hp induction motors of various sizes; also 100-kw transformers, one series arc regulator, about 200 meters and some switchboard instruments. M. T. Gunderson, the former owner of the Kenyon company, has recently announced the purchase of a half interest in the business by his son, Raymond T. Gunderson, who is now manager of the lighting department.

NEW PRAGUE, MINN.—Within the next year or so there will be purchased for the municipal electric-light plant and water-works a 60-kw directly connected unit generator, 230 volts, two-wire, the engine to be of the four-valve type, and the necessary switchboard equipment for this addition. Joseph T. Rynda is superintendent of the plant.

ST. PETER, MINN.—There has recently been purchased for the municipal electric-light plant and water-works a 100-kva General Electric alternator, three-phase, 60 cycles, 2300 volts, directly connected to an Ideal simple non-releasing 225-r.p.m. Corliss engine, and a four-stage high-pressure centrifugal Platt pump directly connected to a General Electric three-phase, 2300-volt motor. F. N. Wilson is superintendent of the plant.

ADEL, IA.—A temporary structure raised since the destruction by fire of the lighting plant in this place recently enabled the town to have lighting service resumed very shortly after the conflagration.

AMES, IA.—Charles E. Warsaw, manager of the municipal electric-light plant, reports that within the next six months it is planned to purchase for the plant one 250-hp water-tube boiler, 150-lb. pressure, one chain-grate stoker for this boiler, and coal and ash-handling material. The entire plant will be rebuilt.

ATLANTIC, IA.—Within the next two months there will be purchased for the municipal lighting plant a 300-hp boiler-feed pump, a 25-kw transformer, and about five miles of pole-line material. T. E. Nichols is manager of the plant.

CHARITON, IA.—At a special election held recently the citizens voted to sell the municipal lighting plant to the Union Co. of Omaha, 314 First National Bank Building, Omaha, Neb., it is reported, and this company will extend and improve the service in Chariton.

DUBUQUE, IA.—The Union El. Co. is changing the Dubuque street-lighting system from arc lamps to nitrogen-filled lamps. Five hundred lamps of 500 cp will be installed. The material has been purchased. E. M. Walker is general manager of the company.

FARNHAMVILLE, IA.—A municipal electric-light plant was recently placed in operation at this place. Governor Clarke spoke at the dedication ceremonies.

OELWEIN, IA.—The Oelwein Lt., Ht. & Pwr. Co. was recently burned to the ground, causing a loss of $50,000.

SAC CITY, IA.—The Sac City El. Co. is completing the erection of a complete new power plant, including a 110-ft. concrete smokestack, and has purchased and recently installed two 200-hp boilers designed for 150-lb pressure, a 300-hp Corliss engine, two Allis-Chalmers alternators, rated at 175 kw and 150 kw respectively, and the necessary switching equipment. The company has just finished a 11-mile transmission line to Lake View, Ia., installed as a 13,200-volt, three-phase, 60-cycle transmission system. W. W. Deininger is manager of the company.

BUTLER, MO.—A new electrical pumping equipment will be purchased during the next year for the municipal electric plant here, which will make the equipment electrically controlled all through. Among other equipment that will be purchased are motor-generating sets, remote-controlled valves and five miles of transmission line material. H. M. Cameron is manager of the plant. E. E. Harper, Grand Avenue Temple Building, Kansas City, Mo., is consulting engineer.

GREENFIELD, MO.—Within the next twelve months the Greenfield El. Lt. & Pwr. Co. expects to purchase a small generator as auxiliary equipment.

KIRKWOOD, MO.—For the municipal electric light and power plant there have recently been purchased one 150-hp boiler, one 100-kva and one 150-kva Westinghouse generator, directly connected to Harrisburg engines, and three generator panels for switchboards. No bonds were voted for this new equipment, but it was purchased with the cash profits of the plant. W. A. Trussell is superintendent of the plant.

MARYVILLE, MO.—The Maryville El. Lt. & Pwr. Co. has recently purchased a 300-hp Stirling boiler.

MONROE CITY, MO.—Within the next two months the municipal electric light, power and water plant engineers expect to erect a switchboard panel and one mile of line which will connect with Hunnewell. The material has been purchased. O. R. Emerson is superintendent.

TIPTON, MO.—Within the next four months there will be purchased for the Tipton electric light and power plant a 40-kw alternator, a 50-hp low-speed engine and a 3-kw exciter. C. E. Clark is city electrician.

WIMBLEDON, N. D.—The new lighting plant has begun operations, and the streets are now lighted by electricity. Forty buildings have already been wired, and it is expected to double this number in a very short while.

HECLA, S. D.—A petition is being circulated for a new electric-lighting system at this place.

PARKER, S. D.—The City Council has awarded the contract for the municipal electric-light plant to the E. M. Fisher Co., Fort Dodge, Ia., it is reported, for $19,998. The plant is to be completed within ninety days.

SIOUX FALLS, S. D.—It is reported that the A. H. Savage Co., St. Paul, Minn., has been awarded the contract for $28,885 for the installation of a new system of street lighting in Sioux Falls.

LINCOLN, NEB.—Bids will be received until Oct. 15 for improvements to the electric light and water plant. T. H. Berg is city clerk.

COFFEYVILLE, KAN.—The diminishing supply of natural gas here may result in the building by the municipality of a water-power plant. The cement dam across the Verdigris River below the pumping station, it is estimated, would furnish the power for lighting and for the water-works for at least eight months of the year.

LEAVENWORTH, KAN.—The installation of the new street-lighting system calls for 150 standards of three-lamp and five-lamp clusters. Bids will be taken by the city engineer for the installation complete and the contract awarded within the next thirty days. Specifications can be obtained from the city engineer. Dr. R. E. Nelson is chairman of the lighting committee; E. W. Crancer is Mayor. W. H. Fellows is manager of the Leavenworth Lt., Ht. & Pwr. Co., which has the lighting contract.

SOUTH HAVEN, KAN.—The South Haven El. Lt. Co. (municipal) expects to purchase within the next six months a 50-hp internal-combustion engine. Whether gas or oil burning has not yet been decided. J. R. Britton is manager of the company.

TOPEKA, KAN.—After reading a report showing that 90 per cent of the communities served by automatic telephone were favorable to its use, the Topeka Industrial Council adopted a resolution approving a proposed issue of bonds for the installation of a municipal automatic telephone plant.

Southern States

WALLACE, N. C.—It is reported that J. L. Boney, contemplates the installation of a lighting plant.

WALNUT COVE, N. C.—It is reported that the equipment for the new lighting plant at this place is being installed and the plant will be in operation very shortly.

CAMDEN, S. C.—The Camden Wtr., Lt. & Ice Co. is defunct and the municipality now operates the lighting plant. L. S. Baxter, who for four years managed the Camden company, has now charge of the municipal plant.

MACCLENNY, FLA.—An election will soon be called for the purpose of voting on a proposed issue of bonds for the construction of an electric-light plant here. The J. B. McCrary Co., Atlanta, Ga., is drawing plans and specifications for the plant. A. G. Powell is city clerk.

PABLO BEACH, FLA.—The citizens voted on Sept. 15 to issue bonds for $10,000 for an electric-light plant. The bond trustees will immediately advertise the bonds for sale and will advertise for bids on the work to be done in accordance with specifications prepared by the J. B. McCrary Co., Atlanta, Ga.

ZEPHYRILLS, FLA.—The Zephyrills El. Co. during the next three months expects to purchase a few small transformers and some switchboard instruments. Waldo M. Francisco is president of the company.

DANDRIDGE, TENN.—The Dandridge Pwr. & Lt. Co., recently organized, has begun operations. The old Bettie mill, at Meeting and River Streets, has been bought, and the site will be occupied by a new plant for which the machinery has already been purchased.

FLORENCE, ALA.—The Allentown Pwr. Co., recently incorporated with a capital of $200,000, it is reported, will develop the water-power on Cypress Creek and build two hydroelectric plants. Col. N. F. Thompson, of Birmingham, is president; T. H. Allen, Florence, Ala., is secretary and treasurer of the company.

CANTON, MISS.—New equipment recently purchased for the Canton El. Lt. & Wtr. Wks. includes a 100-kw Skinner engine, an Ingersoll-Rand air compressor and a Lawrence centrifugal pump. John T. Sharp, Jr., is superintendent of the plant.

BUNKIE, LA.—It is reported that the Bunkie Ice Co., Ltd., is negotiating for the municipal lighting plant at the Bunkie brick works and expects to install an internal-combustion engine directly connected to a 50-kva generator and to change from direct current to alternating current.

GIBSLAND, LA.—H. M. Smith has been granted a franchise for the erection of an electric light and power plant. It is planned to have the plant in operation by Nov. 1, 1914.

MUSKOGEE, OKLA.—Sealed proposals will be received at the supervising architect's office, Treasury Department, Washington, D. C., until Sept. 29, for the installation complete of an electric passenger elevator in the United States post office and court house at Muskogee.

SHATTUCK, OKLA.—The municipal electric light and water plant expects to purchase within the next two months a 100-hp Diesel engine.

AMARILLO, TEX.—Sealed proposals will be received at the supervising architect's office, Treasury Department, Washington, D. C., until Sept. 28 for the construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office and court house at Amarillo, Tex.

MARBLE FALLS, TEX.—The proposition to issue bonds for the erection of an electric-light plant and water-works was defeated at the recent election by a vote of 76 to 54.

PITTSBURG, TEX.—The Home Lt. & Ice Co. has installed new machinery and made improvements approximating in cost $15,000.

Pacific States

NORTH YAKIMA, WASH.—The pumping plants at Outlook and Grandview are to be constructed under the supervision of the U. S. Reclamation Service at an estimated cost of $200,000. The equipment will include a combined turbine and pump installation, generators, motors, etc. O. H. Ensign, Los Angeles, Cal., is chief electrical engineer of the U. S. Reclamation Service, and R. K. Tiffany is project manager at North Yakima.

SEATTLE, WASH.—Bids will be received until 1.30 p. m., Sept. 30, for the installation of the lighting system division of Smith's Cove dock improvement. For particulars address C. E. Remsberg, secretary of the Port Commission, Central Building, Seattle, Wash.

SEATTLE, WASH.—Councilman Cooley has submitted data to the City Council on the power sites of the Sauk and Suiattle Rivers, asking that a thorough investigation be made before the city purchases additional power sites. It is stated that this project can be developed at $38 per hp, and that a single unit will develop approximately 100,000 hp at a minimum flow. A power plant could be erected near Derrington, Snohomish County, and the two rivers could be brought together by means of a canal and a tunnel three-quarters of a mile long. It is thought that this project will be investigated at the time the Lake Cushman and other plants are examined.

STEILACOOM, WASH.—It is reported that the $10,000 bonds recently authorized by the voters to build an electric transmission system have been sold. Work has already begun on the plant and energy will be secured from the municipal plant at Tacoma.

WILLAPA, WASH.—The Willapa Pwr. Co. began operations recently, supplying 95 per cent of the residents of the East End with lighting service. Work has begun in Eklund Park, and it is hoped to furnish service to that section in a short time.

ASTORIA, ORE.—Property owners and merchants on Eleventh Street propose to establish a "white way" from the waterfront to Exchange Street. F. C. Harley, of the Astoria Harbor Improvement Co., is the prime mover in the project. The work will be paid for by the property owners.

ANDERSON, CAL.—At a recent election the citizens of this place voted to establish a lighting system and the town has now closed a contract with the Northern California Pwr. Co., San Francisco, which calls for the lighting of every street crossing in Anderson with a 40-cp tungsten lamp. There will be seventy lamps.

OAKLAND, CAL.—The City Council passed a resolution Sept. 15 authorizing the erection of electroliers on College Avenue, from Taft Avenue to Sixty-third Street. The Vernon-Rockridge Improvement Club has been agitating this improvement for some time. The electroliers will be installed at the expense of the club, and the city will pay for the lighting.

PETALUMA, CAL.—It is reported that the proposition to issue bonds amounting to $10,000 for bridge lighting will be voted upon Sept. 29.

PORTOLA, CAL.—The electric-light plant is expected to be in operation shortly. R. B. Young obtained the franchise.

UKIAH, CAL.—The Snow Mountain Wtr. & Pwr. Co. is reported to be reconstructing its plant at this place. Application has been made to the Railroad Commission for permission to lease a portion of its property to the California Tel. & Lt. Co.

MALTA, MONT.—It is reported that Shade & Levesconte, of Malta, have petitioned the City Council for a franchise to construct an electric light and power plant here.

LA JUNTA, COL.—The city engineer, it is reported, has been requested to prepare an estimate of the amount of bonds required for the building of a municipal lighting plant by the time the franchise of the present lighting company (Arkansas Ry., Lt. & Pwr. Co.) expires, two years hence. At the next regular election the proposition to issue bonds for this purpose will be submitted to the voters.

MONTROSE, COL.—The Western Colorado Pwr. Co., whose offices were recently moved from Durango to Montrose, has completed its new transmission line from Montrose to Delta, 25 miles. This work is part of a consolidation of several lines which will be extended to Ridgeway, Ouray and Silverton.

WINNEMUCCA, NEV.—A franchise has been granted to the Nevada Valley Pwr. Co., whose application was mentioned Sept. 5. It is planned to erect electric transmission lines through the towns and villages of Humboldt County. Edson F. Adams is president of the company.

Canada

KAMLOOPS, B. C.—The new hydroelectric plant, which will get its energy from the Barriere River, will be placed in operation by the end of this month. The first unit will produce 2600 hp, and later the rating of the plant wil be increased to 8000 hp.

REVELSTOKE, B. C.—Escher, Wyss & Co., of Zurich, Switzerland, have been awarded the contract for improvements in the hydroelectric plant, which include a water turbine with a 44-in. valve. The Canadian Westinghouse Company was awarded the contract for a generator, exciter and switchboard. The total cost of the improvements will be $17,000.

STAVE FALLS, B. C.—The Canadian Western Pwr. Co. is making important improvements and increasing equipment of its plant at Stave Falls, B. C. A new 13,000-hp turbine, a 9000-hp generator, a 3000-kw transformer and switchboards will soon be installed for use in connection with the third unit of the plant, the buildings for which are nearing completion. The company has now a rating of 25,000 hp, and with the installation of the fourth unit next year it will be generating over 50,000 hp.

Miscellaneous

HONOLULU, H. I.—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p. m., Oct. 27, for the construction of a concrete water tower.

New Incorporations

DOVER, DEL.—The National Hydroelectric & Conservation Co. has been incorporated with a capital stock of $10,000,000, to establish irrigation and power plants in Western states.

AMO, IND.—The Amo Lt., Ht. & Pwr. Co. has been incorporated with a capital stock of $3,000 by W. W. Cosner, E. B. Owen and J. E. Hodson.

WEST TERRE HAUTE, IND.—The West Terre Haute Utilities Co. has been incorporated with a capital stock of $45,000. The directors are John Schwartz, J. A. Reel and G. L. Berry.

HAMILTON, MO.—The Hamilton Lt. & Pwr. Co. has been incorporated with a capital stock of $30,000 by C. A. Martin, T. D. Parr and J. W. McLean.

ONTARIO, WIS.—The Farmers' Store Lt. & Pwr. Co. has been incorporated with a capital stock of $100,000 by Charles M. Sandon, E. E. Hill and F. A. Johnson.

PRAIRIE FARM, WIS.—The Prairie Farm Electric Co. has been incorporated with a capital stock of $5,000 by O. A. Osterich, L. A. Avery and Leona Westlake.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED SEPT. 15, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,110,326. RAILWAY SAFETY APPLIANCE; J. L. Hoffman, Camas, Idaho. App. filed Jan. 6, 1914. Cab signal.

1,110,345. ELECTRIC SWITCH; G. B. Reisbach, Milwaukee, Wis. App. filed June 1, 1909. Drum type for motors.

1,110,352. ALTERNATING-CURRENT MOTOR CONTROLLER FOR ELEVATORS; A. Simon, Milwaukee, Wis. App. filed Feb. 21, 1907. Repulsion and induction motors of the Wagner type.

1,110,359. ELECTRIC ZINC FURNACE WITH INTEGRAL CONDENSER; C. V. Thierry, Paris, France. App. filed May 21, 1913. Reduction of zinc oxide by means of carbon and condensation of liquid zinc.

1,110,373. TELEGRAPH KEY; R. L. Boulter, Los Angeles, Cal. App. filed Sept. 2, 1913. Transmitter or vibrator.

1,110,374. ELECTRICAL SWITCH; A. J. Bowie, Jr., San Francisco, Cal. App. filed Jan. 23, 1906. High-tension pole-line arc disruption.

1,110,376. AUTOMATIC TELEGRAPH SYSTEM; D. H. Cameron, North Sydney, Nova Scotia, Canada. App. filed Aug. 21, 1913. Single operator for receiving and transmitting.

1,110,415. APPARATUS FOR PRODUCING IGNITION SPARKS WITHIN CYLINDERS OF INTERNAL-COMBUSTION ENGINES; F. A. Zika, Evanston, Ill. App. filed Dec. 8, 1913. Common inclosure for several wires.

1,110,418. SELECTOR; W. S. Burnett, Milwaukee, Wis. App. filed Aug. 26, 1912. Signaling. (Improvement on patent No. 970,180.)

1,110,420. MICROPHONE ATTACHMENT FOR TELEPHONES; H. W. Christensen, Boston, Mass. App. filed March 19, 1913. Supplementary diaphragm.

1,110,430. ELECTRICAL RELAY; J. Erickson, Chicago, Ill. App. filed Nov. 28, 1906. Removable contacts.

1,110,456. ELECTRICALLY LIGHTED LEVEL AND PLUMB; W. E. O'Brien, Providence, R. I. App. filed June 28, 1913. Thumb switch.

1,110,460. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; F. Schoenwolf, Chicago, Ill. App. filed April 15, 1908. Long and short step travel selectors.

1,110,475. ELECTRIC-CONDUCTOR COUPLING; F. Baier, Chicago, Ill. App. filed April 10, 1911. Ball and socket joint.

1,110,477. THERMOSTAT; J. Boekel, Philadelphia, Pa. App. filed Dec. 1, 1913. Circuit-closing float. (Improvement on patent No. 1,094,362.)

1,110,478. FUSE; W. J. Britt, Jr., St. Louis, Mo. App. filed Dec. 15, 1913. Renewable-cartridge type.

1,110,479. ELECTRIC SIGNALING SYSTEM; A. Bull, Brooklyn, N. Y. App. filed June 25, 1910. Automatic registration from plural transmitters.

1,110,485. SAFETY ATTACHMENT FOR TROLLEY POLES; E. C. and E. E. Gossett, Jackson, Ga. App. filed Oct. 14, 1913. Automatic pneumatic retractor.

1,110,490. ELECTRIC-LIGHTING SYSTEM: L. R. Jewett, Lynn, Mass. App. filed July 5, 1913. Automatic gas lighter.

1,110,492. SELECTOR SWITCH FOR AUTOMATIC EXCHANGES; W. Kaisling, Chicago, Ill. App. filed April 15, 1908. A single magnet for adjusting and selecting groups of wipers.

1,110,494. THERAPEUTIC APPARATUS; J. H. Kellogg, Battle Creek, Mich. App. filed July 13, 1912. A light-chamber for treating hands or feet.

1,110,495. INSULATOR SUPPORT; F. P. Kobert, New Haven, Conn. App. filed June 21, 1913. Sheet-metal and bolt construction.

1,110,496. INSULATOR SUPPORT FOR ELECTRIC WIRES; F. P. Kobert, New Haven, Conn. App. filed Jan. 10, 1914. Pole-arm clamp.

1,110,532. INCUBATOR; L. C. Byce, Petaluma, Cal. App. filed Sept. 30, 1913. Automatic regulation of heat.

1,110,578. HANGER FOR TROLLEY WIRES; H. Schütte, Pittsburgh, Pa. App. filed March 2, 1909. Loop-shaped link.

1,110,580. TEMPERATURE ALARM APPARATUS; H. R. Shirley, St. Paul, Minn. App. filed Feb. 10, 1913. Audible and visual signal.

1,110,611. IGNITING DEVICE; L. E. Brandon, Derby, Vt. App. filed Oct. 16, 1913. Hand device for cleaning out gas engine cylinders.

1,110,613. AUTOMATIC TELEPHONE SYSTEM; A. H. Dyson, Chicago, Ill. App. filed April 15, 1908. Controlling the driving magnet of groups of switches.

1,110,634. TELEPHONE SYSTEM; F. A. Lundquist, Chicago, Ill. App. filed Nov. 14, 1912. Collecting and refunding coins.

1,110,648. TYPEWRITING MACHINE; L. R. Roberts, Rutherford, N. J. App. filed Feb. 19, 1913. Electromagnetically actuated type bars. (Seventy-three claims.)

1,110,669. COIN COLLECTOR FOR TELEPHONES; A. E. Case, Chicago, Ill. App. filed Aug. 8, 1912. Automatic coin distribution.

1,110,676. ELECTRIC DISTRIBUTER; L. J. Flint, South Whitley, Ind. App. filed Jan. 10, 1912. For multiple-cylinder ignition, etc.

1,110,757. TROLLEY RETRIEVER; C. I. Earll, New York, N. Y. App. filed Sept. 13, 1907. Spring-drum type.

1,110,758. TROLLEY CATCHER; C. I. Earll, New York, N. Y. App. filed March 20, 1909. Spring-drum retriever.

1,110,759. TROLLEY RETRIEVER; C. I. Earll, New York, N. Y. App. filed June 17, 1909. Spring-drum type.

1,110,783. TROLLEY WHEEL; J. W. Homer, Greencastle, Pa. App. filed June 9, 1913. Tandem wheels.

1,110,784. SPEED CHECK; F. S. Howell, New Rochelle, N. Y. App. filed Feb. 25, 1914. Centrifugally controlled switch for governing a motor vehicle.

1,110,799. REGULATING MIXED-PRESSURE TURBINES; B. Krämer, Charlottenburg, Germany. App. filed Feb. 15, 1911. For exhaust and live steam source.

1,110,805. ELECTRIC SADIRON; E. C. Loetscher, Dubuque, Ia. App. filed Aug. 31, 1911. Resistance ribbon.

1,110,809. AUTOMATIC CALL-DISTRIBUTER SYSTEM; F. R. McBerty, Antwerp, Belgium. App. filed Jan. 6, 1913. Simultaneous multiple control.

1,110,821. MOTOR CONTROLLER; G. R. Radley, Milwaukee, Wis. App. filed June 3, 1912. Brake-pedal-controlled electric vehicle.

1,110,834. SELECTIVE SYSTEM; S. C. Snow, Blakesburg, Ia. App. filed Dec. 12, 1913. Party telephony.

1,110,847. OPERATING VAPOR-ELECTRIC APPARATUS FROM AN ALTERNATING-CURRENT SOURCE: E. Weintraub, Schenectady, N. Y. App. filed Oct. 18, 1902. Supplemental means for producing ionized vapor.

1,110,848. VARIABLE RESISTANCE DEVICE: E. Weintraub, Lynn, Mass. App. filed Aug. 18, 1911. Boron and carbon transmitter.

1,110,870. ELECTRIC BELL RINGER; W. V. Bergen and G. C. Combs, Hillsboro, Ore. App. filed April 5, 1913. Solenoid-operated hammer.

1,110,872. ELECTRIC DISPLAY SYSTEM; C. F. Borschneck, Knoxville, Pa. App. filed Jan. 11, 1913. Switch for producing traveling effects.

1,110,893. DOOR ALARM; C. P. Caulkins, New London, Conn. App. filed Sept. 16, 1913. Knob-operated device.

1,110,896. ELECTROSTATIC SEPARATOR; H. Comstock, Mineville, N. Y. App. filed June 9, 1911. Traveling belts.

1,110,900. SPEED MEASURING AND CONTROLLING DEVICE; J. H. Core, Nashville, Tenn. App. filed March 14, 1913. Indicator and governor for automobiles, etc.

1,110,911. ELECTRIC DETACHING APPARATUS; S. Endel, United States Navy. App. filed June 3, 1913. For life-preservers, etc.

1,110,913. TRAIN DISPATCHER'S TELEPHONE CIRCUIT; H. C. Edgerton, Passaic, N. J. App. filed May 17, 1912. For two different kinds of receivers.

1,110,919. ELECTRIC HEATER; H. A. Gamble, Greenville, Miss. App. filed Feb. 20, 1913. For uniform heating of medicinal solution.

1,110,934. INSULATOR; E. M. Hewlett, Schenectady, N. Y. App. filed April 20, 1907. Disk-strain type; rain-shedder. Priority awarded to Hewlett over Steinberger (patent No. 904,370) by United States District Court affirmed by Circuit Court of Appeals.

1,110,947. INSULATING JOINT AND PROCESS OF MAKING THE SAME; H. J. Lampert, Chicago, Ill. App. filed Jan. 26, 1911. For light fixtures and strain insulators.

1,110,978. HOUSED CONTACT FOR RAILWAY SIGNALING SYSTEMS; B. F. Wooding, Denver, Col. App. filed July 15, 1912. Movable cover.

1,110,989. AUTOMOBILE HORN; R. H. Manson, Elyria, Ohio. App. filed May 6, 1912. Electromagnetic.

13,800 (reissue). AUTOMATIC SIGNAL OPERATOR; E. R. Gill, Yonkers, N. Y. App. filed July 22, 1913. For high-speed telephone and telegraph work. (Original patent No. 1,024,444, dated April 22, 1912.)

The following sixty patents were issued to the Cooper Hewitt Electric Company, of Hoboken, N. J., on original, divisional, continued and renewed applications filed at various times beginning as early as April 11, 1898. Reference will be found to the Cooper Hewitt patents Nos. 682,690 to 682,699, of Sept. 17, 1901; patent of Dec. 3, 1901; patents Nos. 1,014,705, 1,014,965, 1,052,056 and 1,069,695; the Thomas patents Nos. 930,325 and 984,248; the Baker patents Nos. 762,114 and 784,149, and also to pending applications of Hewitt, No. 677,199, filed April 11, 1898, and Hewitt and Rogers, filed March 23, 1901. Detailed digest is omitted owing to lack of space.

PETER COOPER HEWITT PATENTS

1,110,543. STARTING AND CONTROLLING DEVICE FOR ELECTRIC-VAPOR APPARATUS. App. filed April 11, 1902.

1,110,544. ELECTRODE FOR VAPOR APPARATUS AND METHOD OF OPERATING THE SAME. App. filed Jan. 11, 1906.

1,110,546. DIRECTIONAL-CURRENT ARRESTER. Original app. filed Feb. 3, 1903.

1,110,547. METHOD OF TRANSMITTING AND UTILIZING ELECTRIC CURRENTS. Original app. filed April 5, 1901.

1,110,548. STARTING AND CONTROLLING DEVICE FOR ELECTRIC-VAPOR APPARATUS. Original app. filed April 11, 1902.

1,110,549. VAPOR CONVERTER. Original app. filed March 20, 1908.

1,110,550. MULTIPLE OPERATION OF TRANSLATING DEVICES. Original app. filed May 23, 1903.

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1,110,552. VAPOR-ELECTRIC DEVICE. App. filed July 1, 1905.

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